

06

SHORT AND PLAIN
P R I N C I P L E S
OF
LINEAR PERSPECTIVE,
ADAPTED TO
NAVAL ARCHITECTURE.

CONTAINING
RULES TO DRAW CORRECTLY THE FORMS OF SHIPS
IN EVERY POSSIBLE POSITION.

The Whole being rendered so clear that a complete Know-
ledge of the Art may be soon and easily attained.

Illustrated with FIVE COPPER-PLATES.

By A. COBIN.

The Fourth Edition, Revised and Corrected.

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P R E F A C E

TO THIS

EDITION.

A Knowledge of the science of Perspective, for the correct delineation of all objects, is universally admitted; and correctness of delineation is no where more desirable than in the representations of shipping. It is a study equally necessary both to the general painter and the naval artist.

Principally to the latter, however, the present labours will be serviceable. The study of NAVAL ARCHITECTURE, now
nobly

PREFACE.

nobly countenanced, and pursued with ardor, may receive assistance from this publication, which teaches to delineate, with correctness and facility, the forms of ships in all their various positions.

The publisher trusts that this work has already been of service: it has passed, with approbation, through three editions. Having undergone a complete revision, this fourth edition is now respectfully dedicated to the PATRONS of NAVAL ARCHITECTURE.

C O N T E N T S.

C H A P. I.

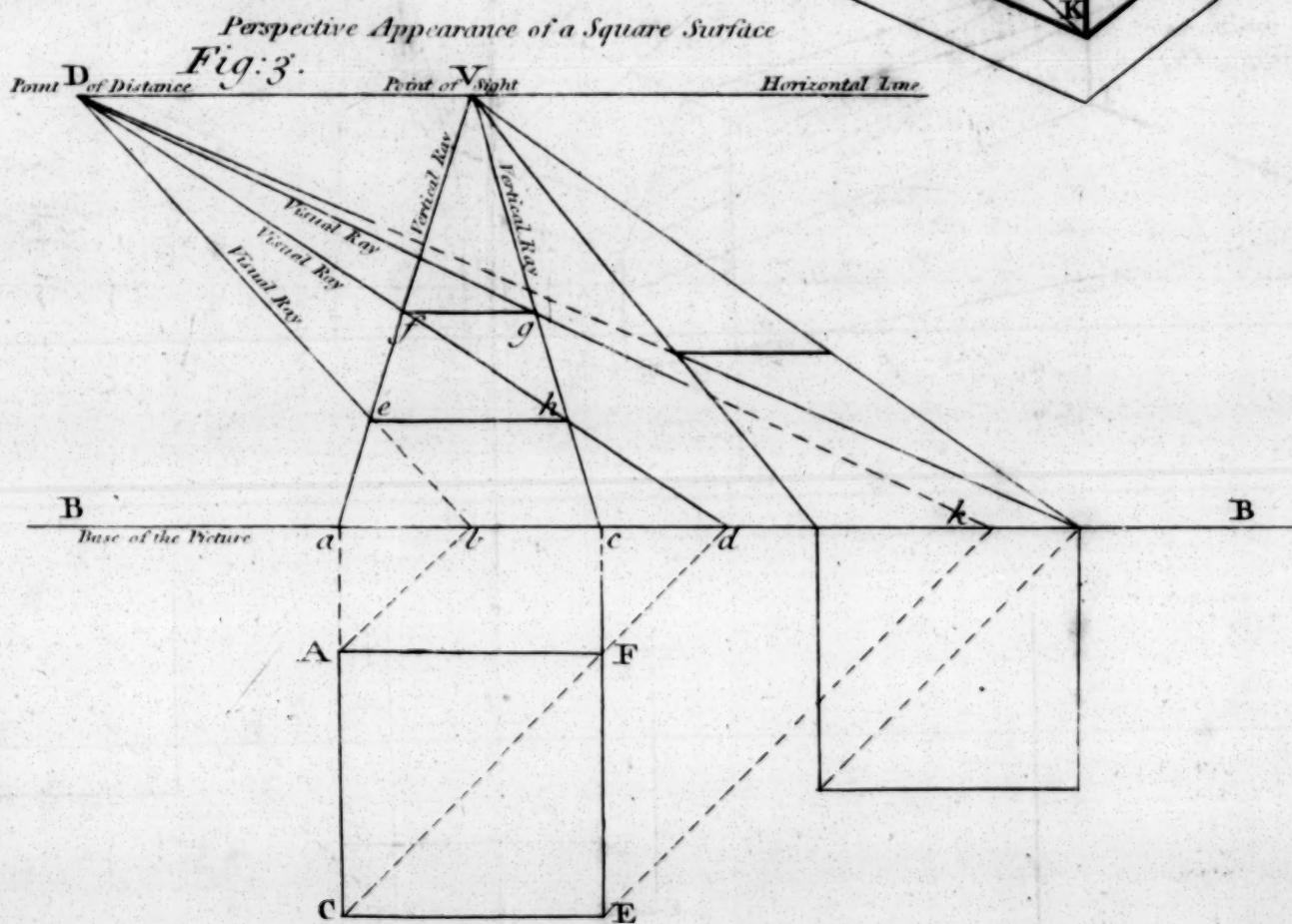
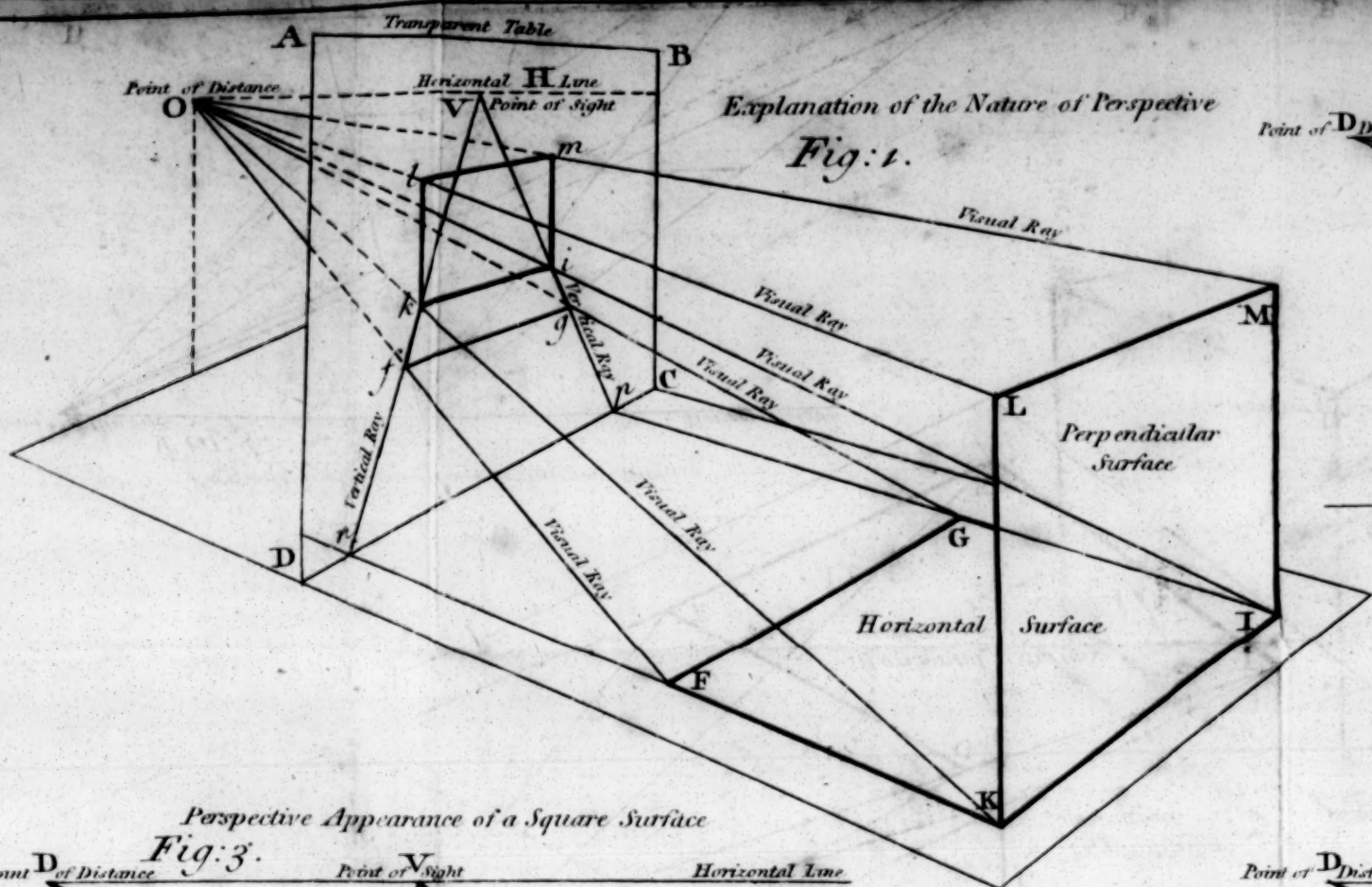
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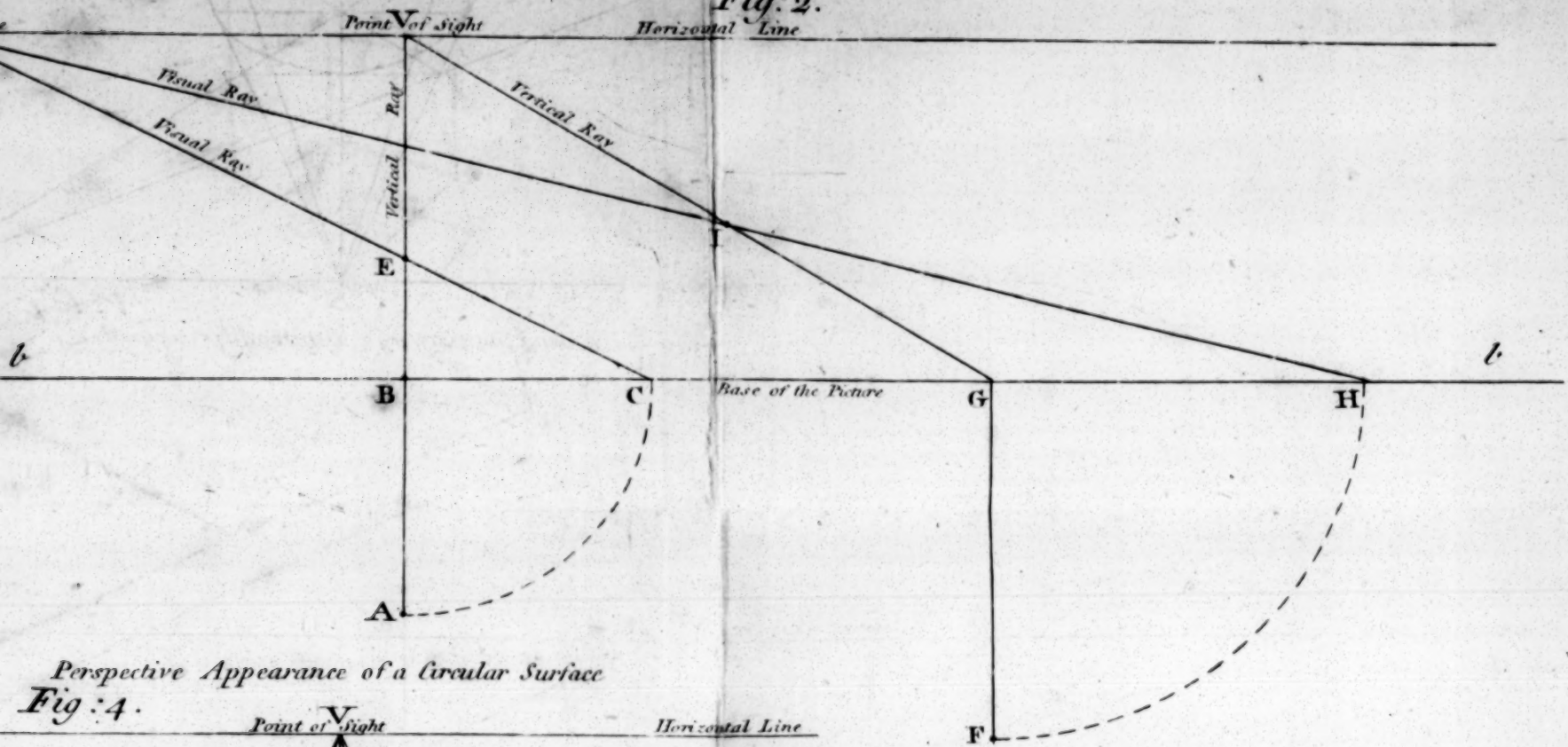
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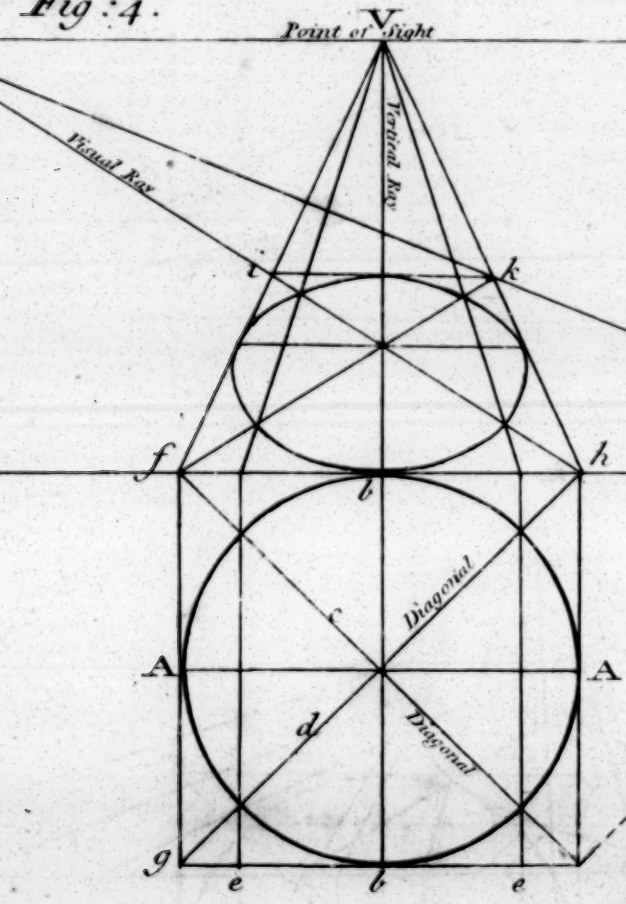


Perspective Situation of a given Point

Fig. 2.

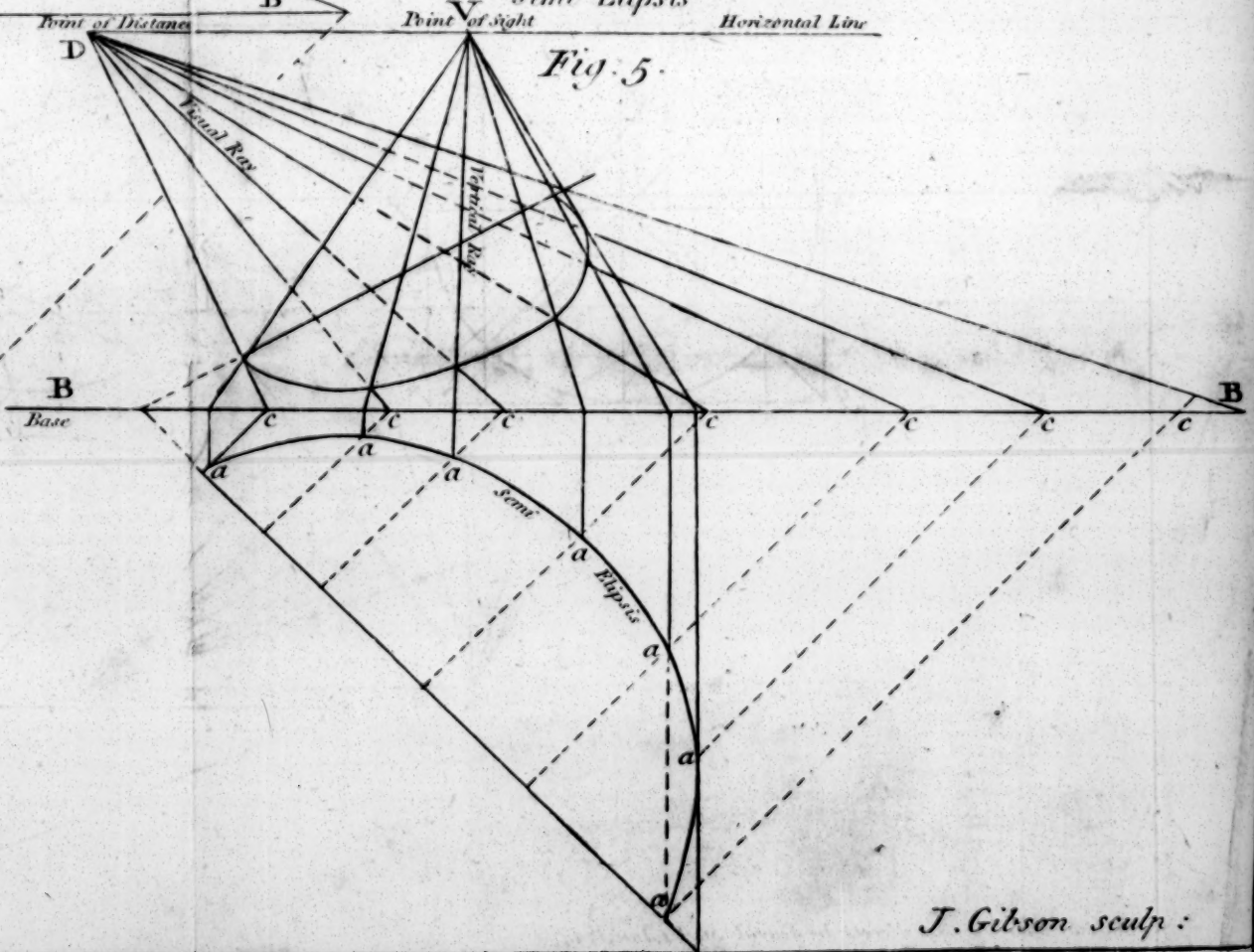


Perspective Appearance of a Circular Surface
Fig. 4.



Perspective Appearance of a
Semi Ellipsis

Fig. 5.



PRINCIPLES OF PERSPECTIVE,

ADAPTED TO

NAVAL ARCHITECTURE.

CHAP. I.

PERSPECTIVE is a science, which teaches how, by certain rules, to procure the exact appearance of all sorts of bodies, however variously posited, at various distances, in such forms as the objects themselves would appear, if viewed through any perpendicular transparent medium, as a glass, lawn, oiled paper, &c. which, in the progress of the work, will be called the table or picture. For the sake of illustrating the idea of this science, A B C D, *fig. 1, plate 1*, represents a transparent perpendicular table or picture, through which any object is to be viewed; let O be the height of the spectator's eye, and placed in the line H (called the horizontal line), in which it always must be placed, because it is always produced by the placing the eye, being the line where the elements of earth and sky seem to unite, in viewing natural prospects.

V represents the point of sight, which, in a picture, is an imaginary point, to which the eye directs its sight, and is always in the horizontal line; it

may be called the centre of the picture, for in it all the vertical rays meet.

O represents the place of the eye, and point of distance, which is also in the horizontal line, and is so far from the point of sight as the picture is from the eye, and may be called the vertical point of the optic cone of rays, or point in which the visual rays meet.

Let F G I K represent a plain horizontal surface (*i. e.* one that lies flat on the ground) draw the visual rays OF OG OI OK from the angles F, G, I, K, to the place of the eye, and the vertices *n*, V *p*.

Then it is plain, that the eye of the spectator, placed at O, will view that surface, in the form it makes in the perpendicular plane or picture at *f g i k*.

Again, if a plain surface of a square form, such as is represented by I K L M be raised perpendicularly, so that the side thereof be every where parallel to the table or picture, then will such a plane be seen by the spectator at O, in the form described by *i k l m*.

PROPOSITION I.

To find the place in perspective of a given point.

Fig. 2.

Let *b b* be the base of the picture, D be the distance from V (the point of sight), DV the horizontal

tal line, and A the point given to be shewn in perspective.

Draw the line A B perpendicular to the base line, and continue A B to the vertical point V; set one foot of the compasses in B, and sweep the arch A C (or, which is the same, set A B along the base line, as B C) then draw the visual ray D C, and where it passes the vertical B V (as at E) there will be the place in perspective for the point A.

Again, for further illustration of this proposition, let the same base, horizontal line, point of sight, and point of distance, be retained; and let a point F be given to be shewn in perspective.

Draw F G perpendicular to the base, which continue to the vertical V, with one foot of the compasses in G, sweep the arch, or set F G along the base from G, draw the vertical V G, and where it passes the visual D H, there will be the perspective place of the point F, namely, at I.

OBSERVATION.

By considering this proposition, it will be easily perceived, that the same method is repeated, in order to find the perspective position of any number of points; and further, that the perspective appearance of any right line, is found by finding the place of the extreme points; for, suppose it was required to find the length of a line comprehended between A and F, it is only finding the proper per-

spective situation of the points A and E, namely, E and I, and drawing between them with a strait ruler, and you will have the perspective appearance of the line required. The same method must be followed when you would find two, or any number of lines.

PROPOSITION II.

To find the perspective appearance of any square surface Fig. 3.

Let B B be the base of the picture, D V be the distance of the eye from V, (the point of sight,) and let A C E F represent a square surface to be shewn in perspective, having a side parallel to the base of the picture.

As two sides of this figure are parallel to the base, the other two are consequently perpendicular to the same; therefore,

Continue A C and E F to the base line, and also continue both the lines, viz. *a C E c*, up to the point of sight V; transfer *a A a C E c* along the base, from *a* and *c*, where each of them fall into the base; as likewise

Draw from D the visual rays D *b* D *d* D *h*.

Then will D *d* give the diagonal of the square, *e*, the point corresponding with A, *f* the point corresponding with C, *g* will give the point corresponding with E, and *h* the point corresponding with F.

Which

Which being joined with right lines, you will have the perspective form of the square surface, A C E F, as was required.

O B S E R V A T I O N .

By this operation it will appear, that all lines, which are parallel to the base of the picture in the geometrical plan, (*i. e.* that in which the real dimensions of the plan of any object are expressed,) will also be parallel in the perspective appearance to each other, and to the base line; and all lines that are, in the geometrical plan, perpendicular to the base, deviate into vertical rays, and terminate in the point of sight; but if any lines, which are parallel to each other, and in an oblique position, (*i. e.* neither perpendicular to the base, nor parallel to it,) be continued, they will all meet in a point somewhere in the horizontal line, and this point is called the *accidental point*.

This being well considered, it will very much shorten the work of finding the perspective appearance of any square surface; for as, by transferring the distance from the base of the remotest point of the side next the point of distance along the base, you will have, by drawing the visual, at once, the diagonal of the perspective form of the square comprehended in the visuals D *d*; there will remain nothing to be done, but to draw two lines parallel to the base, from the points wherein this diagonal crosses

crosses the verticals $a V c$; and thus it will be, let the situation of the square be near, or remote from the base, as you see by the square, which is posited close to the base line.

It is to be remarked here, that all the lines that can possibly be drawn between the visuals $a V c$, from the base $a c$, to the point of sight V , are to be looked on as all of an equal length with $a c$, and gradually decreasing to the point of sight, till they terminate in that point: Also,

That whatever side of a plain or solid object you would have next the eye, in perspective appearance, that side must, in the plan (called the geometrical plan) be next the base.

PROPOSITION III.

To find the perspective appearance of a circular surface. Fig. 4.

In order to shew a circle in perspective, there must be marked several points at pleasure, in the circumference of it, and from each point a perpendicular to the base must be drawn, and each continued from the base up to the point of sight.

Then proceed by the foregoing rules, to find, by visuals, the several places of these points in the verticals answering thereto; and lastly, by joining these points by a curve, you will have the perspective form of the circle; or, draw a square to contain

tain the circle, so that two sides may be parallel to the base, bisect the sides, and draw the lines $A A b b$; draw also the diagonals $c d$, after which, draw from $e e$ perpendiculars to the base. To pass through the circumference of the circle, where the diagonals cut it, continue those perpendiculars to the base, and up to the point of sight; transfer $f g$ along the base from f to k , draw the visual $D h$, and you will have the diagonal of the perspective square; draw $i k$ parallel to $B B$ for the remote side of it; draw the other diagonal, as also, bisect it parallel to the base, through where the diagonals cross each other; after which is done, you will have all the points in perspective, conformable to those, through which, in the geometrical plan, the circle passes; which being joined with a curve line, you will have the perspective appearance of the circle required.

PROPOSITION IV.

To procure the perspective appearance of a semi-ellipsis. Fig. 5.

Let $B B$ be the base of the picture, $D V$ the distance from the eye to the picture, and V the point of sight; and let $a a a a a a a$ be a curve line (or semi-ellipsis) to be shewn in perspective.

Set off in the curve a number of points at pleasure, as $a a a a a a a$.

B 4

From

From each of those points draw lines to the base that shall be perpendicular thereto.

Continue those perpendiculars from the base up to the point of sight.

Set the lengths of each of those perpendiculars along the base, from the point where each of them fall into the base.

To the spot, where each of those perpendiculars reach from the place they are set off, draw the several visuals from D, as Dc Dc Dc , &c.

Mark on each vertical the spot in which its respective visual passes it, which spots being joined by a curve line, you will have the perspective form of the curve line required.

PROPOSITION V.

To raise three points in perspective to an equal height. Fig. 1, plate 2.

Let BB be the base of the picture, DV the distance from the eye to the picture, V the point of sight; and,

Let $a b c$ be three points given, to be shewn in perspective, and elevated to the height comprehended between $d e$.

Find the perspective situation of the three points, according to the rule before given for shewing a point in perspective.

After

After having done which, take the height to which they are to be elevated, *viz. d e*, between your compasses, and transfer it to the base line of the picture, and draw from each end a line, both of which shall terminate in a point in the horizontal line, as *f d f e*.

Draw from each of the perspective places of the three points *g h i*, a line parallel to the base, which shall pass through the lines *f d* and *f e*; and the length comprehended between these lines *f d* and *f e*, on each parallel, will be the perpendicular height to which each of the points, from whence it is drawn, is to be raised.

The reason of this work may easily be collected, from what has been said in the observations under the instructions for putting a square surface into perspective, namely, that all lines comprehended between any two verticals, (or any lines drawn from any two remote points in the base, and terminating in one point on the horizontal line,) and parallel to the base, are to be esteemed of an equal length with the space between the two points on the base from whence these verticals are drawn (*i. e.*) *k k l l m m* equal *d e*.

Therefore, in the present case, we want the length of the line *d e*, at the three several distances of the three perspective places of the given points *g h i*, which are found to be *k k l l* and *m m*, and which being raised perpendicularly at their corresponding points, will give the elevation at each, equal *d e*, as was required.

PRO-

PROPOSITION VI.

To find the perspective appearance of a cube, or figure comprehended under six equal squares, resembling in form a die. Fig. 2, plate 2.

Let BB be the base of the picture, DV the distance from the eye to the point of sight, and V the point of sight; and let ac be one of the equal sides of a cubical solid to be shewn in perspective.

Draw the square $ACEF$, the side of which be equal to ac , which will represent the form, position, and situation of the geometrical plan of the cube.

Continue the sides AC and EF to the base of the picture, and from thence to the point of sight V .

Transfer eC along the base from e to g .

Draw the visual Dg , and you will have at once the diagonal of the perspective plan of the cube, which will be finished by drawing a line parallel to the base, where each end of the diagonal passes the vertices $V e V f$.

Set up on the further side, at each angle, a perpendicular equal to the side, also do the same at the nearer side; join the tops of those four perpendiculars by right lines, and you will have the perspective appearance of the cube, as was required.

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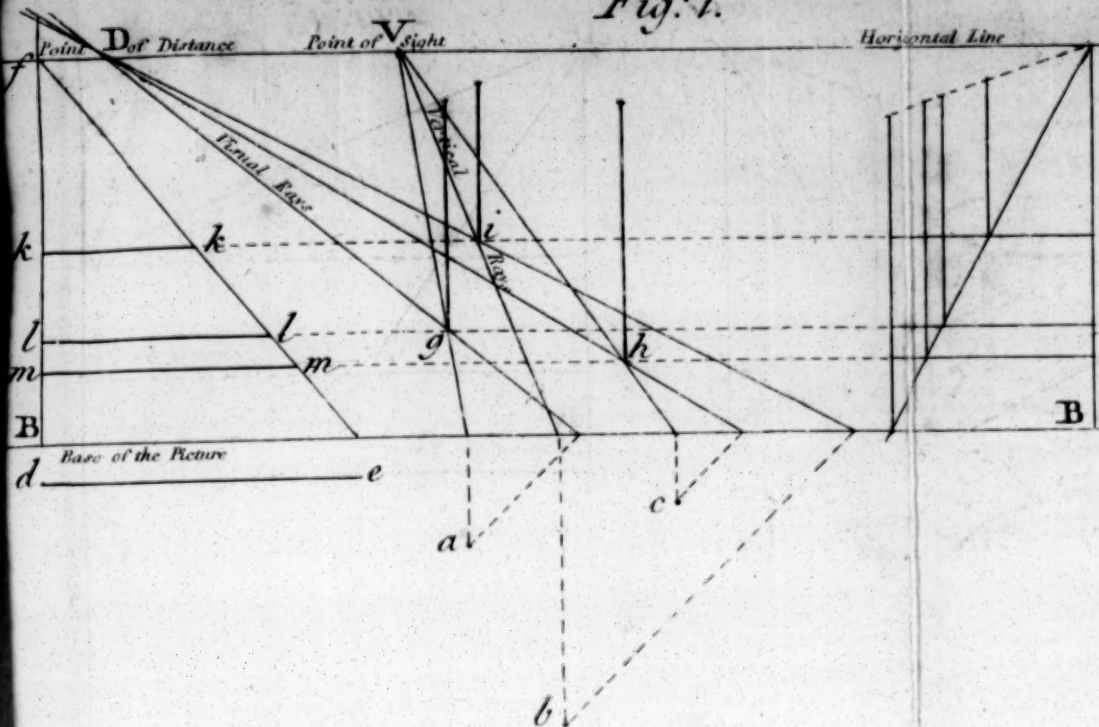
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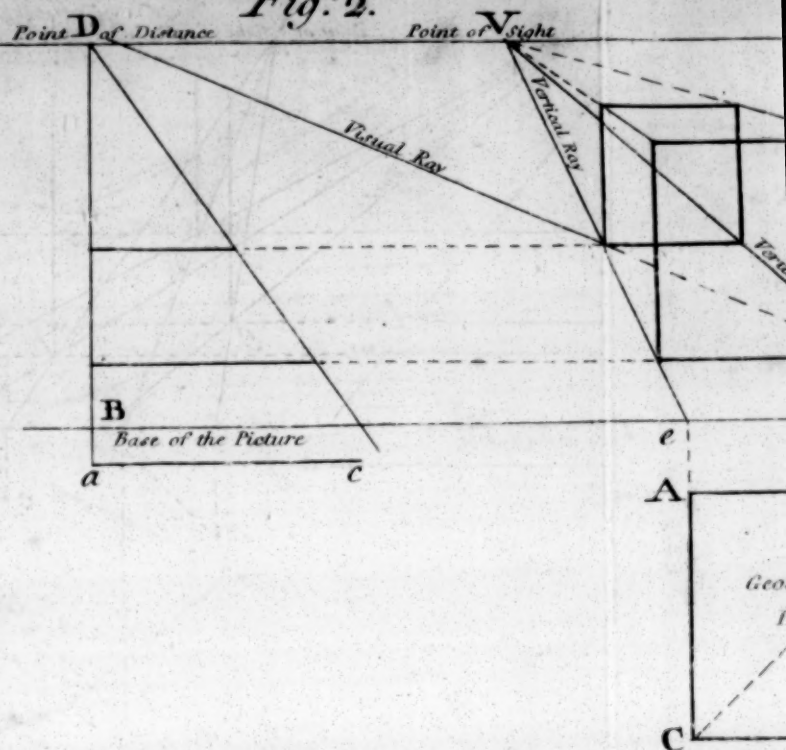
Perspective Appearance of three Points raised to an equal Height

Fig: 1.



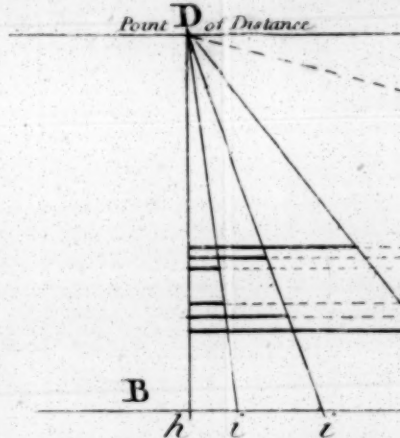
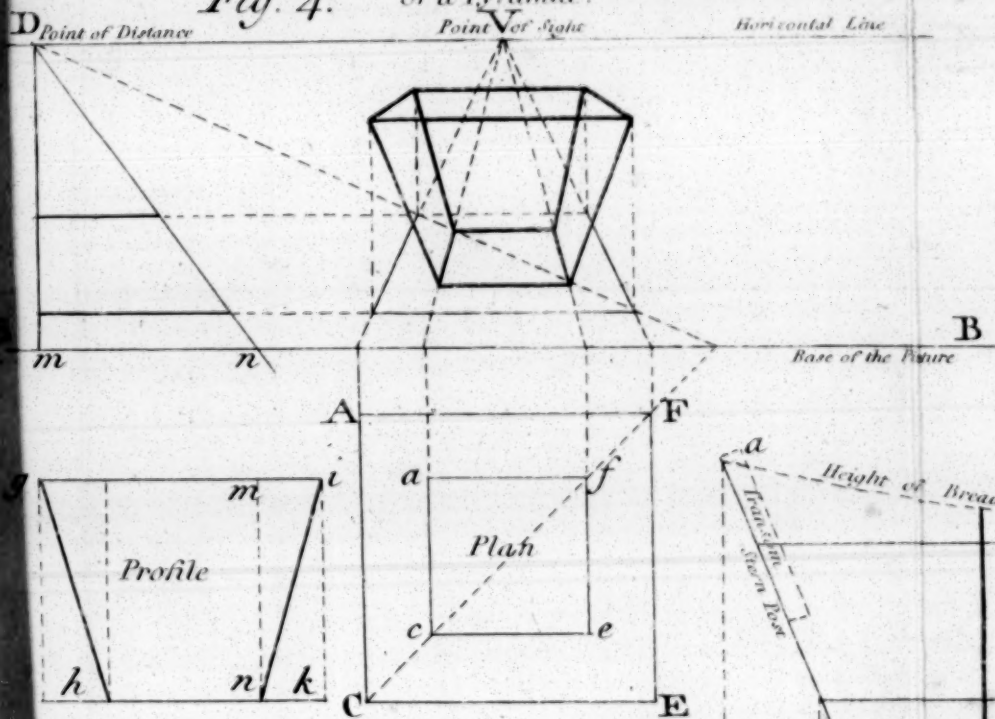
Perspective Appearance of a Cube.

Fig: 2.

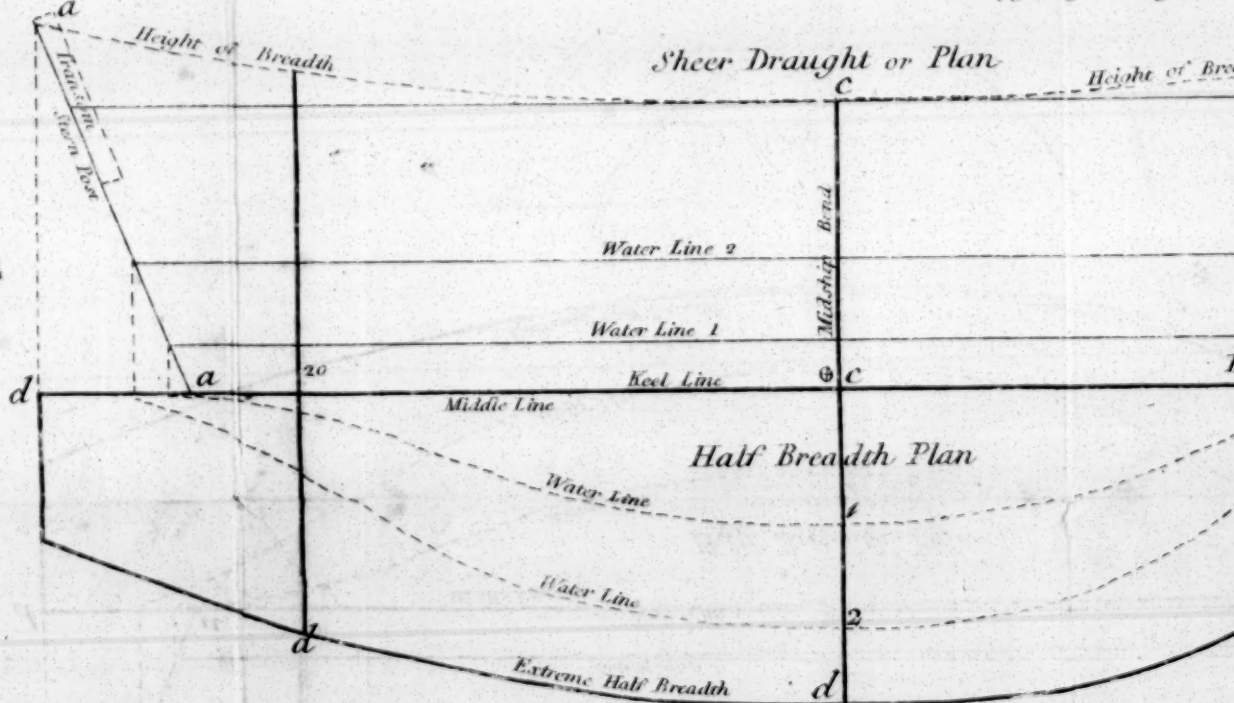


Perspective Appearance of part of a Pyramid.

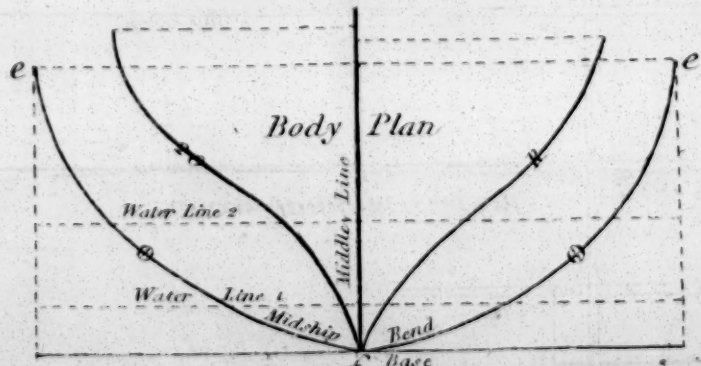
Fig: 4.



Sheer Draught or Plan



Half Breadth Plan



Published as the Act directs, by David

Fig: 3. Perspective Appearance of an irregular six-sided Solid Figure.

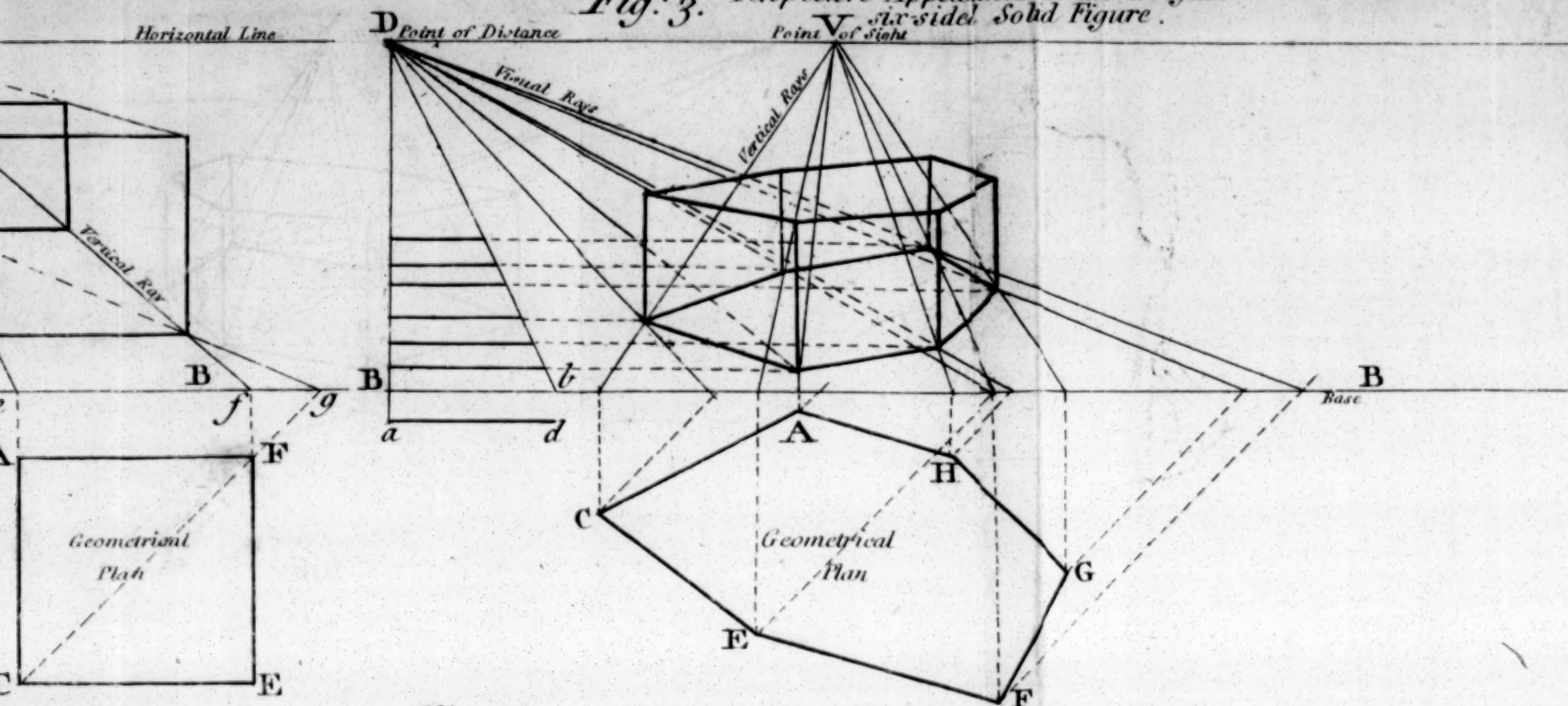
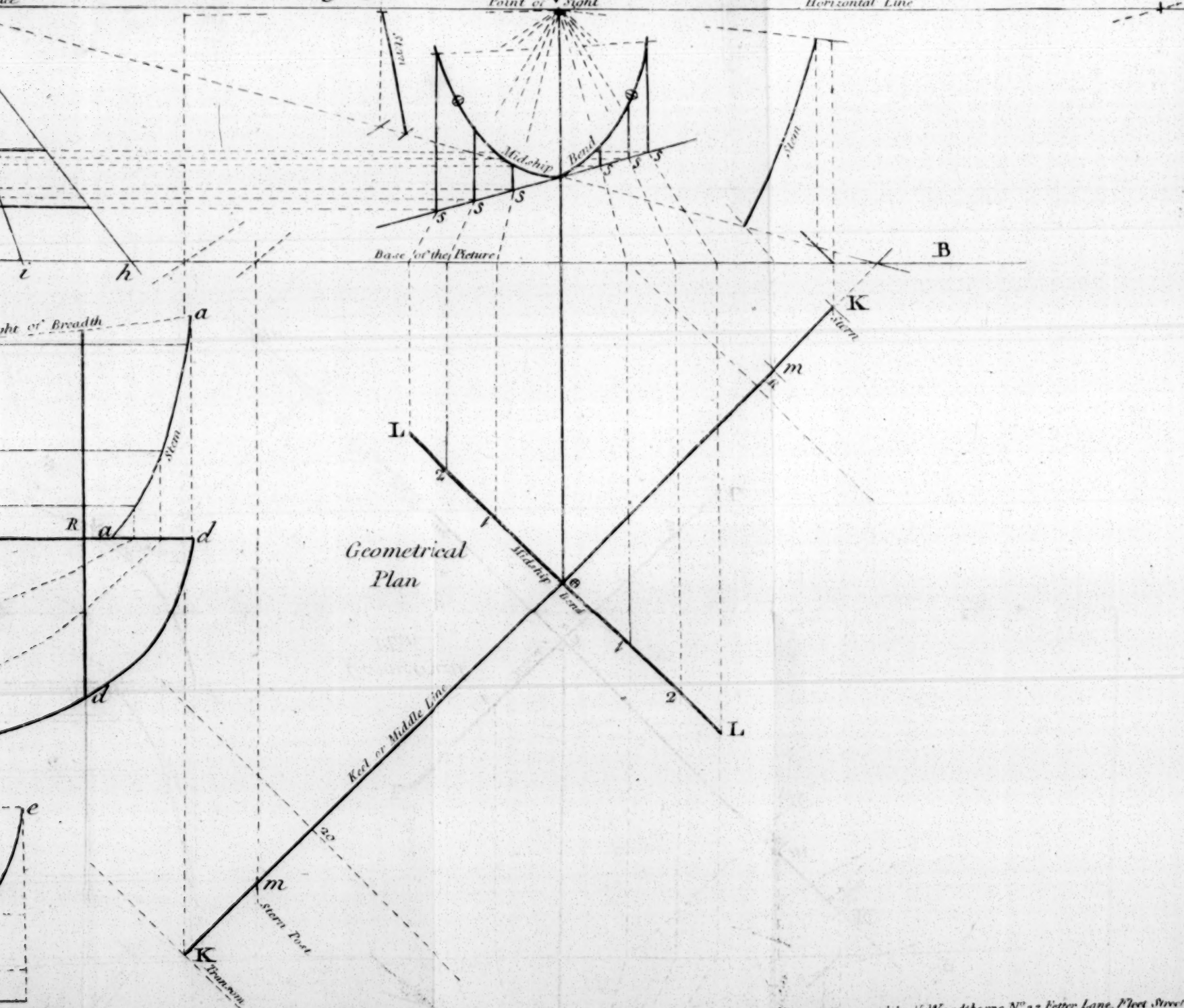
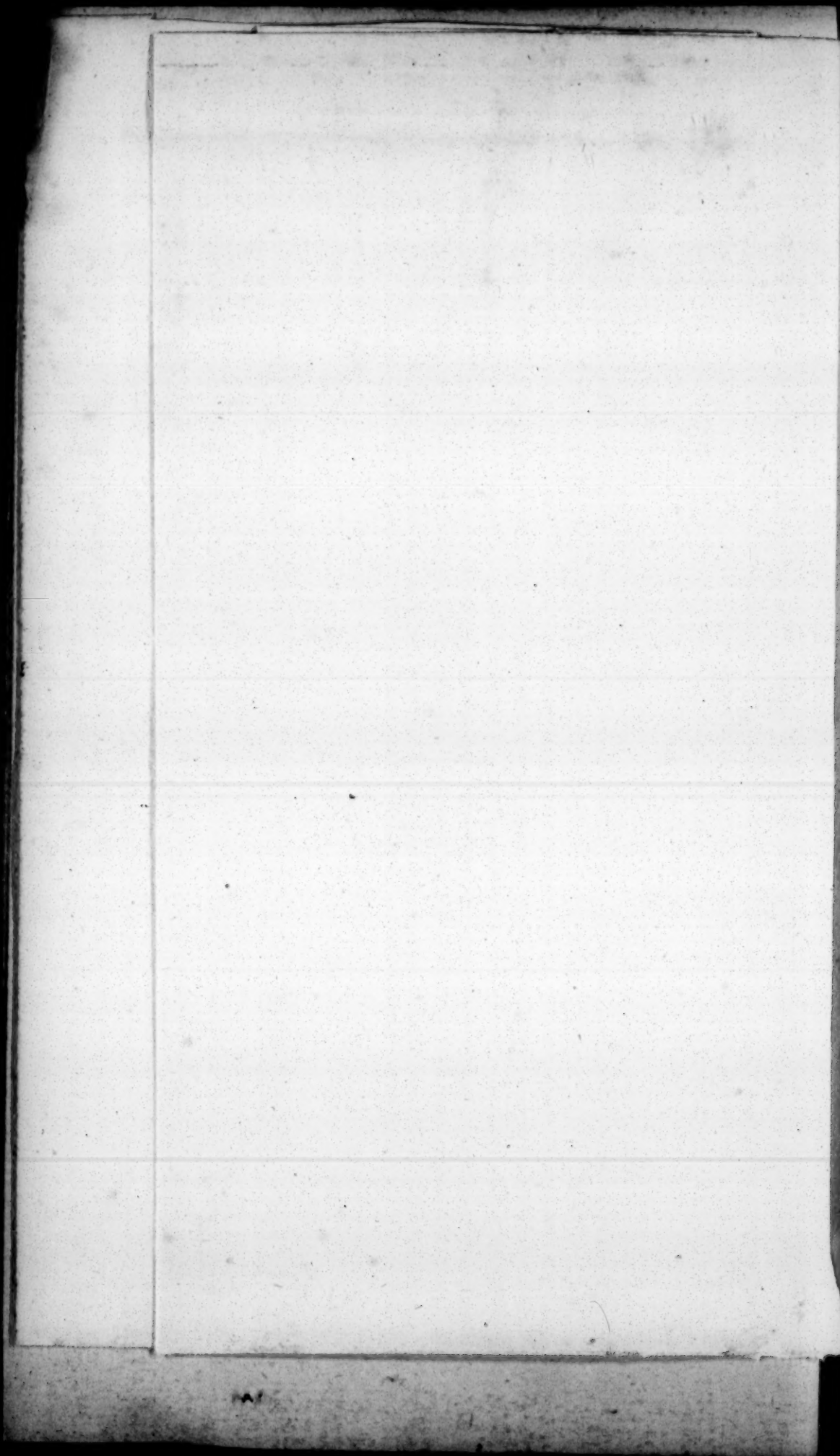


Fig: 5. Perspective Appearance of the Midship Bend





PROPOSITION VII.

To find the perspective appearance of an irregular six-sided solid figure; the form of the ground plan of which is represented by A C E F G H, and the altitude thereof by the line a d. Fig. 3. plate 2.

Let B B be the base of the picture, D V the distance of the eye from the point of sight V, and let A C E F G H represent the form, position, and situation, of the plan of the solid figure to be shewn in perspective.

Draw, from each of the angles of the geometrical plan, a line up to the base, which shall be perpendicular thereto.

Continue all those perpendiculars up to the point V.

Transfer the lengths of all these perpendiculars along the base, from the points wherein they meet the base, and to the points where they fall in the base; draw the several visuals from D, and mark where they cross the verticals.

Join the spots together with right lines, and you will have the perspective appearance of the ground plan, or one side of the solid to be shewn in perspective.

After which, set off along the base the length of the line a d, and from each end draw a line to the horizontal line, so that both may terminate in a point in that line; which being done,

Draw,

Draw, from each of the angles of the perspective plan, lines parallel to the base, which shall pass the lines $D B$ and $D b$.

Which being done, set up at each angle the part of the line drawn from it, which is comprehended between $D B$ and $D b$.

Join the tops of these perpendiculars by right lines, and you will have the perspective appearance of the irregular solid required.

PROPOSITION VIII.

To find the perspective appearance of any solid representing part of a pyramid, or which decreases from one surface to another similar thereto, by strait lines. Fig. 4, plate 2.

Let $B B$ be the base of the picture, $D V$ the distance from the eye to the point of sight, which let be V , and let $A C E F a c e f$ be the plan of each end, which two squares are to be determined by the figure $g h i k$, which represents the section of the solid, and is generally called the profile.

After the plan of each side is laid down in the position and situation you chose,

Proceed to find the perspective appearance of both these squares, as has before been directed.

Which being done, raise the points, at the angles of the greater square, (as we propose to shew the bigger end upwards,) to the perpendicular altitude of the section or profile, namely, $m n$, and join the
tops

tops of these perpendiculars by right lines; after which, draw, from the angles of this elevated square, right lines to the angles of the lesser square, each corresponding to each, and you will obtain the form in perspective of the figure required to be shewn.

OBSERVATIONS ON PLANS.

It is very necessary to consider well the nature and properties of the plans of solids, because it will be impossible to produce any solid in perspective appearance, unless you have a clear idea of the manner of laying down the geometrical plans of all the different objects to be shewn in perspective, especially in solids which taper rectilinearly, and have similar ends, and also, such as may have dissimilar ends; both of which surfaces must always be carefully laid down, just as they bear to each other in their angles and sides, as if, in the *fig. g h i k*, after being set on its small end or surface, all the intermediate substance was at once taken away, and the upper or greater square or surface was to fall down horizontally, the said upper surface would bear to the lower, as in the *fig. A C E F a c e f*.

As it is absolutely necessary to have a clear insight into the method of projecting plans of rectilinear solids, so it will be much more so to be able to judge of what plans will be proper to be projected, in order to produce the various solids made up

up of curvilinear lines, (especially the form of a ship, which has the greatest variety of any other solid that can be named,) and in which respect, it will be necessary to imagine the body to be cut from end to end, into a convenient number of sections, which shall be every where equidistant from one another, and all must be horizontal.

PRIN-

PRINCIPLES OF PERSPECTIVE,

ADAPTED TO

NAVAL ARCHITECTURE.

CHAP. II.

BEFORE we proceed to the explanation of the propositions which are the principal design of this work, it may be understood that, although the preceding propositions lie in a small compass, an attentive person may very easily, without the help of any other treatise, become an able master of the science of *rectilinear perspective*, especially if he diligently practises the figures laid down, and then varies their situation and position with regard to the base, by throwing them out of a parallel into an oblique direction; for the method to be observed is exactly and universally the same as already prescribed, namely, drawing a line from each angle to the base, which shall be perpendicular thereto, and continuing all those lines to the point of sight. For it will be easy to comprehend, that, if we can find the place of one point in perspective, we may find the places of as many as we please; and, from them, lines and surfaces; and, if we know how to elevate properly one point to a given altitude, we may raise one hundred.

The

The principal positions of ships, to be shewn in perspective, are either,

1st, When the whole side from stem to stern is shewn, which is generally called among the shipwrights the sheer draught, and may not be improperly called, in the language of perspective, the side view. This is the easiest position to put into perspective, for the keel-line, or middle-line of the object, is always parallel to the base of the picture, and the several lines which cross it at right angles, shewing the places on the keel-line where the frame timbers are placed, if continued to the base, will from thence to the point of sight deviate into vertical rays, in which vertical rays the perspective position and length of the keel-line is to be found, also the spots for determining the several perspective breadths fore and aft, necessary to be found from the geometrical plan, to ascertain the places from whence perpendiculars are to be raised, to produce the various heights fore and aft, to shew the sheer at the gunwale; of which more particularly hereafter, under the proposition for putting a ship into perspective.

2^{dly}, If the position of the geometrical plan of the ship to be shewn in perspective be so, that the middle or keel-line be perpendicular to the base of the picture, either in a direct line with the perpendicular vertical ray, or on either side of it, the middle or keel-line will, when continued to the base-line of the picture, from thence deviate into a vertical

tical ray; and if, from the several spots on the cross lines, (shewing the geometrical plan of the position of the frame timbers,) determining the various breadths fore and aft, perpendiculars be continued to the base-line, and from thence drawn to the point of sight, you have thereby the proper perspective breadths of the several frame timbers, (after you have found their perspective situation and disposition, which in this case will be parallel to each other, and all of them so to the base of the picture,) or the several spots, from whence perpendiculars are to be raised, to determine the proper heights of the gunwale fore and aft; of which more particularly hereafter.

This disposition of the body of a ship requires the most skill in management, in order to produce an agreeable picture; and therefore should be particularly attended to, to know readily how to assume a proper point of sight and height of the eye, that there may be a harmony in the parts.

3dly, Besides these two positions, there is another which may be called the oblique position, with regard to the base line; being parallel to the base line, neither in the situation of the keel-line, nor that of the timbers, and is very various, according to the greater or less degree of obliquity intended to be shewn.

And in this case, as in the geometrical plan, neither the keel, or middle line, nor the lines shewing

the situation of the several timbers, will be parallel to the base of the picture; so in the perspective plan, neither the keel-line will be parallel to the base, but, if continued, fall into the horizontal line; nor the situation of the several frame timbers be parallel to the base, but will, if continued, all meet in a point somewhere in the horizontal line, which is, as before-mentioned, called the *accidental point*.

In order that those, who have not seen and examined into any building-draughts of boats or ships, may have an idea of the different projections necessary to be made, in order to produce the forms of lines, and from them the proper molds for constructing the several timbers fore and aft, above and below the height of breadth, and other parts which are connected in the complete structure; let it be observed that *fig. 5, plate 2*, represents three projections necessary to be laid down, *viz.*

1st, That which is marked with *a a a a* is principally useful, in order to shew the extent of length above and below, and the several heights fore and aft, especially at the timbers called the frames. This projection is generally termed, among artists, the *Sheer-Draught*, shewing at one view, the broad side and sheer of the upper part of the ship; and *c* denotes the midship-bend or timber, being the place where the ship or boat, &c. is broadest, and generally shallowest or lowest in the side. The midship-bend is always distinguished, in the drawings

ings of shipwrights, with the mark which it has in the plate.

2dly, The projection, immediately under that above mentioned, is called the *Half-Breadth Plan*, i. e. the lowest curve line, marked *d d d d d d*, is the half breadth extreme; and those between the same line and the strait line called the keel-line, (or where the strait section from head to stern is made to determine half the ship, &c.) are called water lines, i. e. the form which half the body of the ship makes in the water, when immersed horizontally to the depth of the lines corresponding thereto in the *Sheer-Draught*, which lines are generally, or rather always, formed and completed from.

3dly, The projection, which is called the *Body-Plan*, or form of the several timbers; representing their various curves in or out, from a perpendicular in the middle of the body, and are completed from the water-lines in the *Half-Breadth Plan*; for, till the body, or the several timbers which compose it, are so formed as to produce fair lines, there must be necessary alterations made, in order to bring about this end: it is therefore very necessary to consider the nature and properties of, and the connections between, these several plans, that you may be able to form the body of a ship, &c in perspective appearance.

PROPOSITION IX.

To find the perspective appearance of the midship-bend of a ship, &c. as high as the breadth lies, (called the height of breadth, or the place from whence a ship, &c. narrows in, both above and below,) and also the perspective elevation of the middle line of the stem and stern post.

Let therefore B B be the base of the picture, V the point of sight, D the distance, and let K K be the position and situation of the keel or middle line of the sheer draught before described, and let L L be the position and situation of the midship bend represented in the body plan, and marked *efe*; the perspective appearance of which is to be found and shewn in perspective.

After you have laid the plan of the keel-line, and the plan of the midship-bend to the extreme breadth on each side of the middle line; proceed to find, on the plan of the midship-bend, the breadth of the several waterlines, marked 1, 2, on each side, and corresponding with the figures 1, 2, in the *Half-Breadth plan*; after which, draw lines from each of those spots to the base line, which shall be perpendicular thereto, and continue them all up from the spots in which they fall on the base, up to the point of sight, also from the point, where this line crosses the keel line; mark likewise on the plan of the keel, or middle line, the spots which determine the length of the
keel

keel fore and aft the plan of the midship-bend, in order to find the true perspective appearance of the keel; these two spots are marked *mm*: at the same time the extreme length above, at the highest place of the stem and stern-post, must be marked on the middle or keel-line; these you will find by the mark *KK*: which being effected, we shall have all the spots necessary for finding the perspective midship-bend; and also the perspective elevation of the middle lines of the stem and stern-post. After these last mentioned, which are all situate in the keel-line, have lines drawn from thence to the base, which are to be perpendicular thereto, and from thence to the point of sight; proceed, by the foregoing directions, to put a point into perspective. Find the place of the two extreme points of the keel-line, and also the extreme points which determine the length aloft; also the situation of the line representing the plan of the midship-bend, as it will appear in perspective; after which you will have the spots thereon, from whence perpendiculars are to be raised, to determine the different elevations, namely, where the vertical rays pass the said line, marked *sss sss*, which being done, take the height of the midship-bend *c* from the sheer draught, and transfer it to the base of the picture, as *hh*; draw from *hh* lines that shall terminate in a point at the horizontal line, as *h D h*; set off on the base *ii* the height of the water lines, transferred also from the sheer draught at the midship-bend; when

this is done, draw from each of the points on the perspective situation of the midship-bend, where the verticals cross it, a line that shall pass from thence to the perpendicular Dh , all of which shall be parallel to the base of the picture; which being effected, you will have the lengths of the several perpendiculars comprehended between hDh and particularly distinguished by the black lines, which are to be raised at the spots in the perspective plan of the midship bend, from whence the parallels are drawn; when these perpendiculars are raised carefully, and a curve line formed, which shall pass through all of them, and terminate in the point where the perspective keel-line crosses the plan of the midship-bend, you will have the perspective form of the midship bend required. In order to find the perspective elevation of the middle line of the stem or stern-post, find the extreme perspective length of the middle line of the *Sheer-Draught*, which you will obtain by observing where the extreme verticals cross the perspective situations of the middle line, also the just length in perspective of the keel, which you will have by noting where the vertical next within to those above-mentioned cross the perspective middle line; after which, raise from the base line in the picture, where the extreme verticals cross it, a perpendicular at each, equal in height to those at the head and stern in the *Sheer-Draught*, observing which ought to be at the head, and which at the stern; at the same time raise a perpendicular

lar

far at each of the extremities of the perspective middle line ; and, by laying a ruler from the top of the perpendicular in the base line, to the point of sight, draw a line to cross the perpendicular at the extremities of the middle line, and where it crosses, there will be the proper perspective perpendicular height of the head and stern.

OBSERVATION.

In the foregoing proposition, I have made use of the midship-bend for the subject of it, because that is the broadest, and curves only in one direction, and therefore more easily put into perspective, and appears less perplexing to the understanding to comprehend; but which, if strictly attended to, and imitated by way of exercise, will render the manner of the perspective operation for finding the whole set of frame timbers, fore and aft, easy; in performing which, it will be necessary to set off more points in either of those represented in the body plan within the midship-bend on each side, than in the midship-bend, because these have two different directions in their curve ; scarcely less than six being sufficient, beside that in the keel-line, where any of the timbers is to terminate. It will be more easy for a young artist, to find the spots sufficient to form the perspective appearance of the aftermost frame, and ink it in, after which it will be best to rub out all the preparatory lines in pencil, in order to avoid, as much as possible, the perplexity which is

inseparable from a multiplicity of lines, by which means the work will go on pleasantly, and the effect be more certain; not only so, but by this management you will produce your design in considerable less time, which is a material point in perspective operations.

PROPOSITION X.

To find the perspective appearance of a ship brought down to her load-draught of water, swimming in an upright position, and at a determined distance from the base of the picture in an oblique situation. Plate 3, fig. 1.

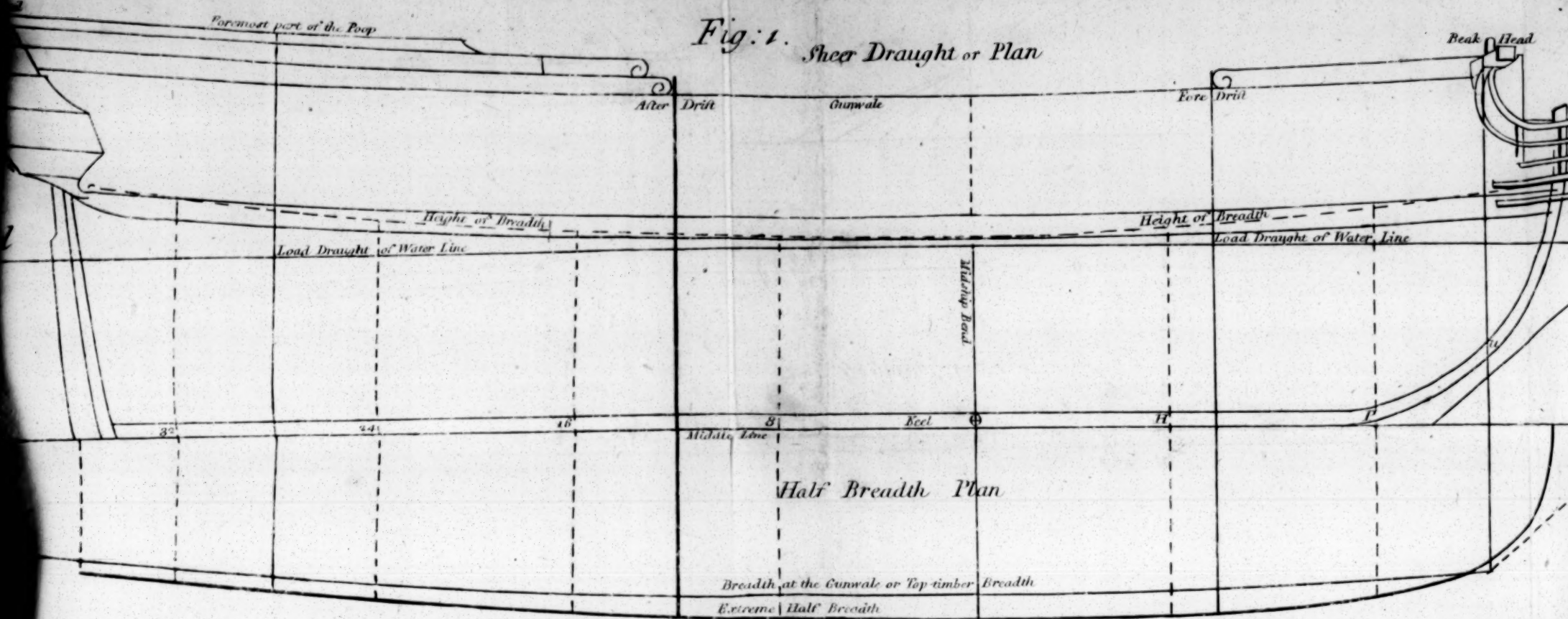
Let B D be the base of the picture, V be the point of sight; and, in order that the object may appear to the best advantage, let the point of distance be from the point of sight sixteen inches (or fifty-four feet reduced to a quarter of an inch scale); as it is proposed that measurement shall be the length of the picture; the reason of which more particularly hereafter.

But, before we proceed to lay down the *Geometrical plan* of the ship to be shewn in perspective, it will be necessary to say something relating to the management which is made use of in prosecuting this proposition, it consisting of the methods of contracting plans into a small compass, which would otherwise extend over and cover a greater quantity of paper, though, at the same time, the dimensions of the

the perspective object is still kept up to the scale proposed; and by managing the point of distance so as, although in fact, it be twelve, fourteen, or sixteen inches from the point of sight, or centre of the picture, and frequently without the limits of the paper, to bring it into a narrower compass, and more under the eye, and within the extent of moderate sized rulers and compasses, all of which conveniences extremely facilitate the practice of perspective. This is produced, 1st, by reducing the *Sheer-Draught* to a scale of one sixteenth part of an inch to a foot, conformably also to which, are reduced in the same manner, (having chosen that size preferable to any other, as it will be small enough to be handy, though large enough not to be confused and obscure in the perspective operation) the *Half-Breadth and Body-plans*. Further 2^{dly}, in the scheme where the horizontal line and point of sight are laid down and adjusted, you will find that the whole height between the real base and the point of sight, is divided into four equal parts; at the third of which from the real base, and parallel to it, you will see an *imaginary base line* drawn, the use of which will be this; after having fixed on a situation for the middle line of the *Geometrical plan*, and transferred from the *Half-Breadth plan*, the extreme breadth, and that at the height of the top-timbers, you will find that all the necessary breadths proper to be made use of (in number not less

less than six) at different places between the head and stern, are also transferred from the *Half-Breadth plan*, both at the water's surface and at the gunwale; and the whole are carried up from the middle line to the base, in the *Geometrical plan*; and are thence transferred to the *imaginary base line* before mentioned, by which method of proceeding, the effects in perspective will be the same as if the *Geometrical plan* was laid down four times as large, and the perpendiculars only extended from the *Geometrical plan* up to the base. 3dly, With regard to the management of the point of distance, whatever the whole extent thereof is from the point of sight, divide it into a half, a quarter, an eighth, or one sixteenth, &c. and set any one of these parts with compasses along the horizontal line (in this operation I have made choice of one eighth of the whole distance between the point of sight and the proposed point of distance of sixteen inches, which will be two inches); after which, let fall from the spot next the point of sight, a perpendicular line P P, which shall reach to the base of the picture; and in the prosecution of the perspective operation of this proposition, regard this line as a perpendicular vertical ray, and in consequence of this consideration, find the various distances of the several points of the *Geometrical plan* to be shewn in perspective on this line, and transfer them from thence to the several verticals to which they belong, always remembering to observe

Fig: 1. Sheer Draught or Plan



Body Plan
of the Frame
Timbers
below the
Breadth

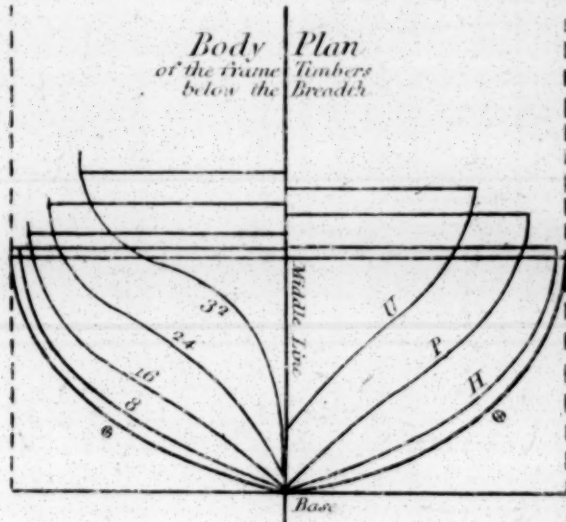
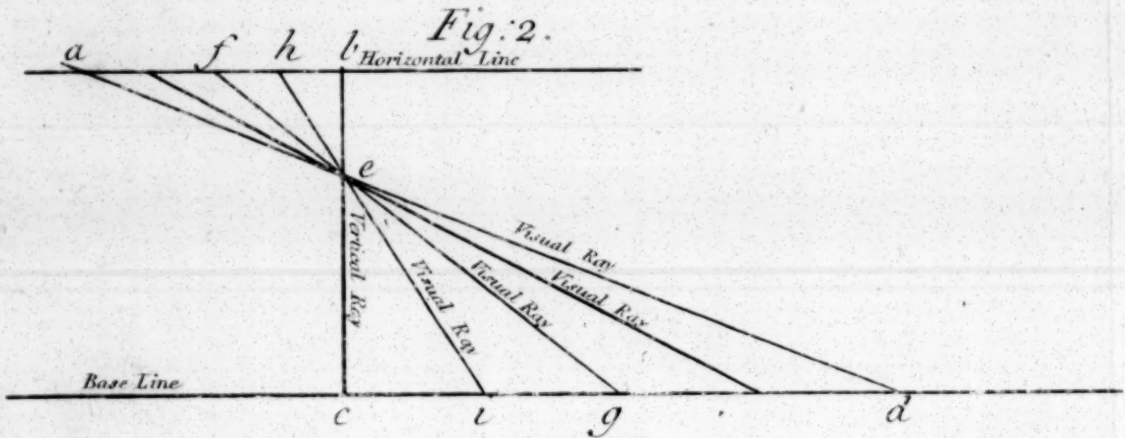


Fig: 2.



$\frac{1}{8}$ of the real dist:

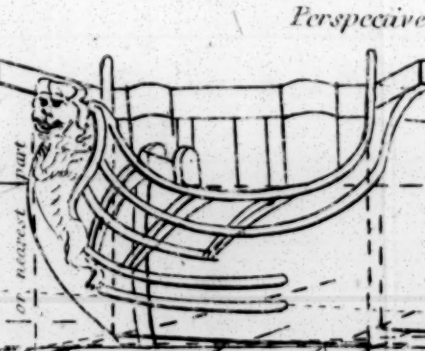
P

Horizontal Line

This Line continued to the Horizontal Line
gives the Accidental Point

Real dist. nearest part 192 feet.

Perpendicular or Vertical Ray

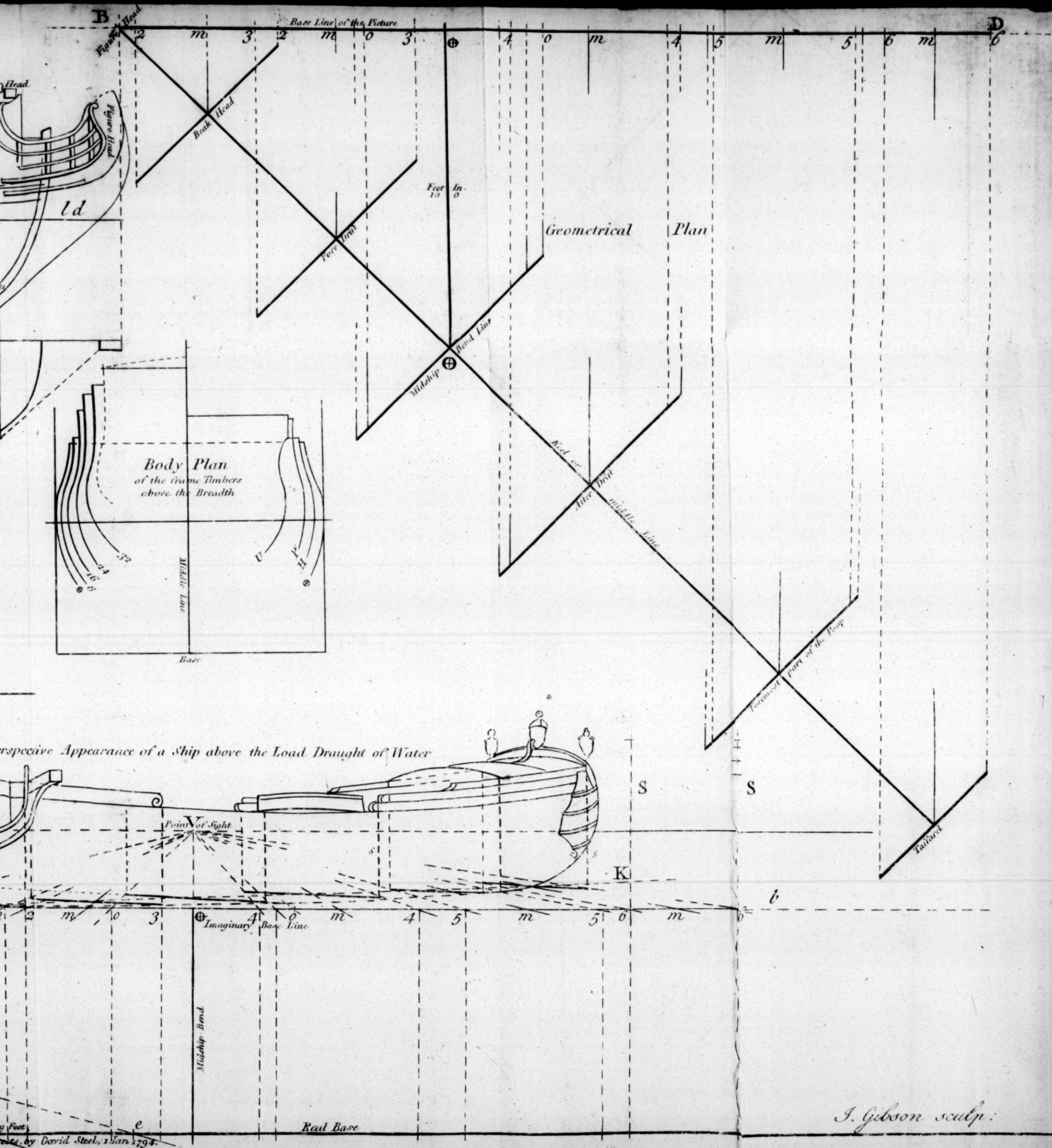


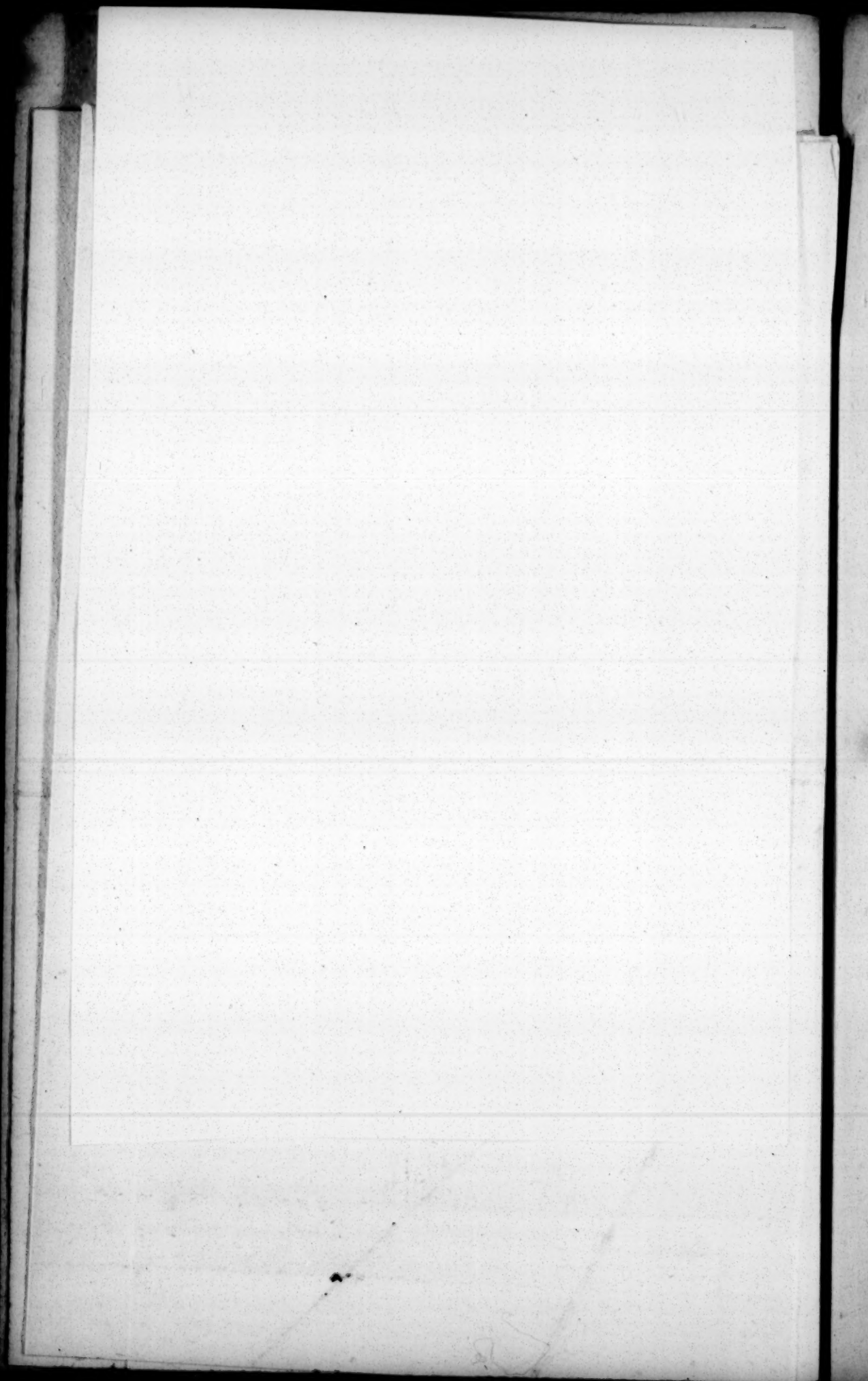
Perpendicular of the Head
or nearest part

P

$\frac{1}{8}$ of real dist: 24 feet.

$\frac{1}{8}$ the distance of Midship Band point d 24 feet





observe carefully this general rule, namely, that whatever part of the whole distance from the point of sight to the point of distance, you choose to set off along the horizontal line, whether a half, a quarter, an eighth, or a sixteenth, &c. you strictly take care that you set the same or similar part of the real distance of every point of the *Geometrical plan*, from the base along the base, from the foot of this perpendicular line, assumed for the use above mentioned; the consequence of which will be this, the several distances to be found will be brought into a considerably smaller space of paper, and the perspective process carried on with much more ease, and the effect sooner produced. This explanation of the method made use of was necessary, that the practice of it might be more easily comprehended, and applied to the procuring the perspective plans of all sorts of objects, which may be very remote from the base line of the picture. For the reason of this management, observe that, in *fig. 2, plate 3*, *ab, cd* resemble the horizontal line and base line, *bc* a vertical ray, and *ad* a visual, and then the whole figure will represent two similar triangles joined at their verticals, in such a manner, that two of their sides, *viz. be* and *ec*, will be in a right line, as also *ae* and *ed*; now, if *ab* be bisected or divided into two equal parts, as at *f*, and at the same time *cd* be bisected as at *g*, and a right line be drawn from *f* to *g*, that line will pass through the point *e*, where the line *ad* passed

passed through it on the line bc ; in like manner, if the fourth of ab be set off from b , as at h , and from thence a line be drawn through e , it will divide cd into a similar part from c , namely, one fourth at i .

The angle under which objects are to be viewed, treated of at the end of this work, will further elucidate this part of the subject. We now therefore proceed to the perspective operation of this proposition.

Having fixed on a situation for the *Geometrical plan*, (I have made choice of that in which the keel or middle line, if continued till it falls into the base line of the picture, would make an angle with that line of forty-five degrees, both for the sake of brevity in the work, and perspicuity in the effect, *plate 3.*) and laid it down, namely, the extreme length between the fore part of the figure head, to the after part of the top of the taffarel, or, as it is commonly called, the stern, measured from where the perpendiculars from the two above mentioned places cross the load-draught of water line, in the *Sheer-Draught*, marked $ldld$; which done, set off, from the *Sheer-Draught*, the proper place for the midship-bend upon the *Geometrical plan* of the keel or middle line, and at the same time, on the same line, the several distances of the places which we propose to make use of to ascertain the breadths, and from whence the per-

perpendiculars are to be raised, which, as we have said before, cannot well be less than six; afterwards let these several lines be carefully drawn in, and at each of them, the breadth extreme, and the upper breadth, or that at the gunwale, be set off from the middle line on each of these thwart lines, which you must carefully transfer from the *Half-Breadth plan* which you find directly under, and connected with the *Sheer-Draught*; after which, let lines be drawn, from each of the spots determining the lower and upper breadths, up to a line marked B D, representing a base line for the picture; when these several lines from the spots in the *Geometrical plan*, are drawn up to the line above mentioned, and all of them perpendicular thereto, the *Geometrical plan* of this proposition will be sufficiently completed for the present purpose. Therefore to proceed,

The artist is to consider what height will be proper to pitch on for the point of sight, which must be governed by the object to be produced; (in this case I have chosen ten feet by a quarter of an inch scale, or two inches and a half, the measure hinted before, that being near about two thirds of the height of the ship at midships, which will be found a commodious height in general;) which being fixed, draw the base line, and also the horizontal line, or height of the eye, of the same length, and parallel to each other; also draw an *imaginary base line* three-fourths of the distance of the base line

line from the horizontal line, which is to be parallel to each of the lines above mentioned, as *bb*, to be used as the real base; this being adjusted, the next thing to be determined is, how the object shall bear to the point of sight (or, in other words, what part of the object the eye directs its sight to, or is the centre of the picture, or to which the other parts of composition must be regulated); which, in the proposition before us, you will find to be the perpendicular imagined to be raised from the keel-line where the midship-bend crosses it, and in the perspective operation is a perpendicular vertical ray *O V*.

The next material point to be settled, is the distance or length between the eye and the picture, and is, in perspective operation, measured from the eye to the point of sight, (centre of the picture, or point wherein, on the horizontal line, all the verticals meet,) along the horizontal line, as it receives its very being from the eye of the spectator.

In the present case I have fixed the point of distance at sixteen inches, or sixty-four feet, reduced to a quarter scale, as before hinted, the benefit of which distance will be; the eye will with more ease comprehend the object or objects, if more than one, which may be introduced within the compass of sixteen inches, or sixty-four feet: and it may be a general rule to make the distance of the eye from the picture, equal the length you propose the picture to be.

The

The next thing to be done is to transfer, from the *Geometrical plan*, the several measurements on the base line of the picture, to the *imaginary base line*. The figures on each of these operations will shew their connection, as the figures correspond in both. We shall have for the next step, to find the several spots in perspective, which are to ascertain the places from whence the several perpendiculars are to be drawn, to form the sheer at the gunwale, and also the spots which determine the breadths at the surface of the water, and which are to be connected in the complete perspective form of the hull of the ship.

In order to effect which, find the distance of the nearest spot, *i. e.* that, to which the top of the fore part of the figure at the head is perpendicular; which will be found by drawing a line $D d$, from the point of distance through the vertical ray $P P$, where it is cut by the *imaginary base*; for, as that line will determine on the base of the picture from the foot of $P P$, one eighth of the distance of the line $b b$, so consequently, it will give us one eighth of the distance of the nearest part of the object, because as we have said before, we propose to make the distance determined, that place will be as commodious as any, to fix a capital object in, so as that it may be seen to the greatest advantage; and, thus situated, the distance of the nearest part of the object will be about 192 feet by a quarter of an inch scale.

scale. Which done, the next material point to be found is that made by the crossing of the keel-line and midship-bend line ; for, the perspective place of that being found, you will have atonce the perspective situation of the keel-line, by drawing a line from the nearest point for the perpendicular height of the head to be raised from, through the perspective place of the point formed by the intersection of the keel-line and midship-bend line ; this is effected by finding four times the length of the midship-bend, which is forty feet ; (as we propose to produce our design in perspective, as if formed from a quarter of an inch scale ;) and, adding it to the distance of the nearest point, *i. e.* 192, makes 232 feet, the sum of those two numbers being divided by 8, the quotient will be 29 feet or $\frac{1}{8}$ of the real distance from the base to the point, of the midship-bend ; which set along the base of the picture from P P, and draw D e, and where that line passes P P, that will determine a spot at the distance we require ; and which height from the base being transferred to the perpendicular vertical ray, and measured thereon from the base, you will have the point ascertained, which will give the perspective situation of the keel or middle line, by laying a ruler upon this point, and that under the fore part of the figure at the head, and drawing a line at pleasure k K ; furthermore, as we have chosen such a situation for the *Geometrical plan* of the keel or middle line, that, if it be continued to the base line, it will make an angle there-

therewith equal to forty-five degrees, or a right angle bisected; so likewise will the place of the mid-ship-bend, if continued till it falls into the base, be in the same direction with the base line, as we have said the keel or middle line, *i. e.* a right angle bisected, or one of forty-five degrees; and, as this will be the effect in the *Geometrical plan*, so it may be remarked that in the *Perspective plan*, there will be a similar effect, namely, that, if the perspective keel or middle line be continued, it will fall somewhere into the horizontal line; and, if the distance of that point from the point of sight, be set along the horizontal line from the point of sight, and on the contrary side thereof, that will be the point, which, in the second proposition, is called the accidental point, that is to say, the point in which all the perspective plans of the several breadths, if continued, will meet; therefore it is of singular consequence, in operations of this nature, to know the proper management of it, in order to save a great deal of trouble; for instance, in the case before us, by the help of this point, we may easily come at the perspective positions and directions (with regard to the keel-line) of all the various thwart lines on which we are to determine the various breadths in perspective, and on which spots are to be found, from whence perpendiculars are to be raised for completing the sheer.

By drawing the verticals which are derived from the perpendiculars drawn from the intersec-

D

tion

tion of the middle line, and the *Geometrical plans* of the breadths marked *m*, fore and aft, and then laying a ruler to the accidental point, as before taught, and also where the verticals last mentioned cross the perspective middle line, and draw through each a line, long enough to extend to the verticals which are derived from the geometrical extent of the several breadths, you will obtain by this step the perspective situations of all the lines expressive of the breadths fore and aft, in proper positions and length; and furthermore, on these lines the verticals will determine the various breadths in perspective; and, at the same time, the spots from whence the various perpendiculars are to be raised, in order to ascertain the spots, through which a curve line is to be drawn to complete the sheer.

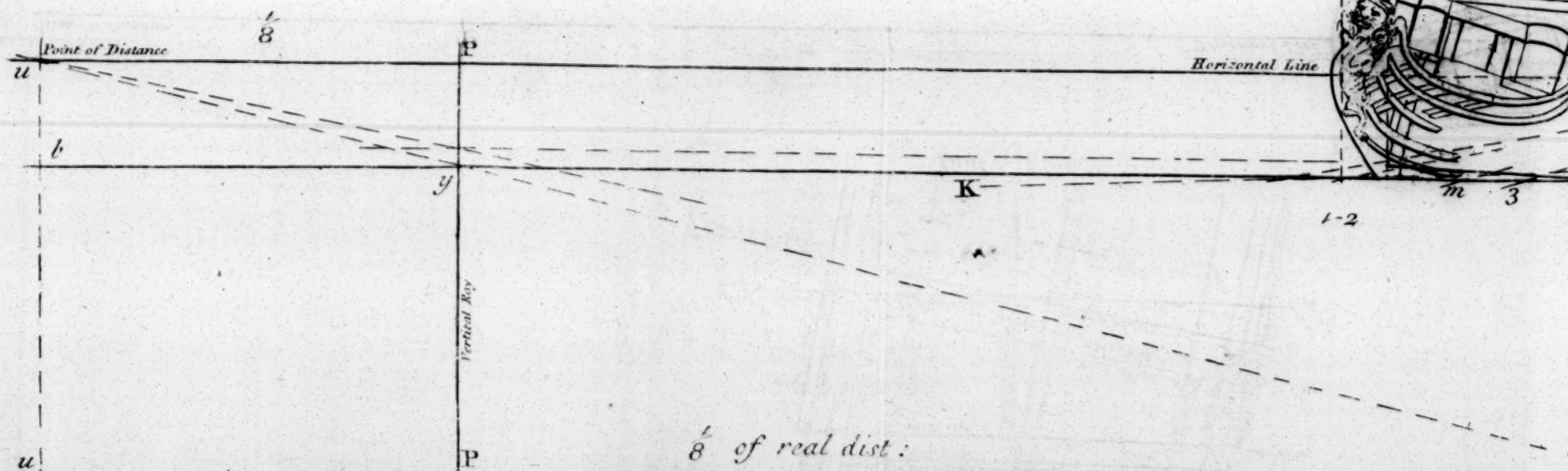
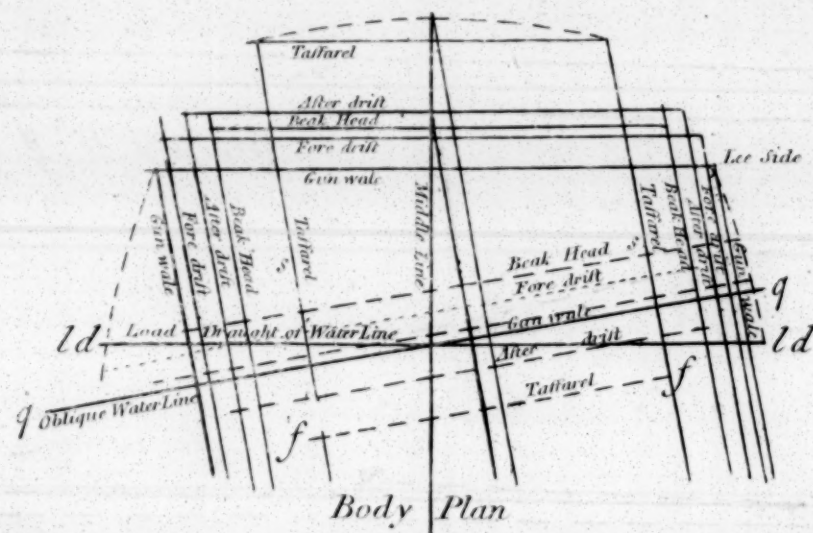
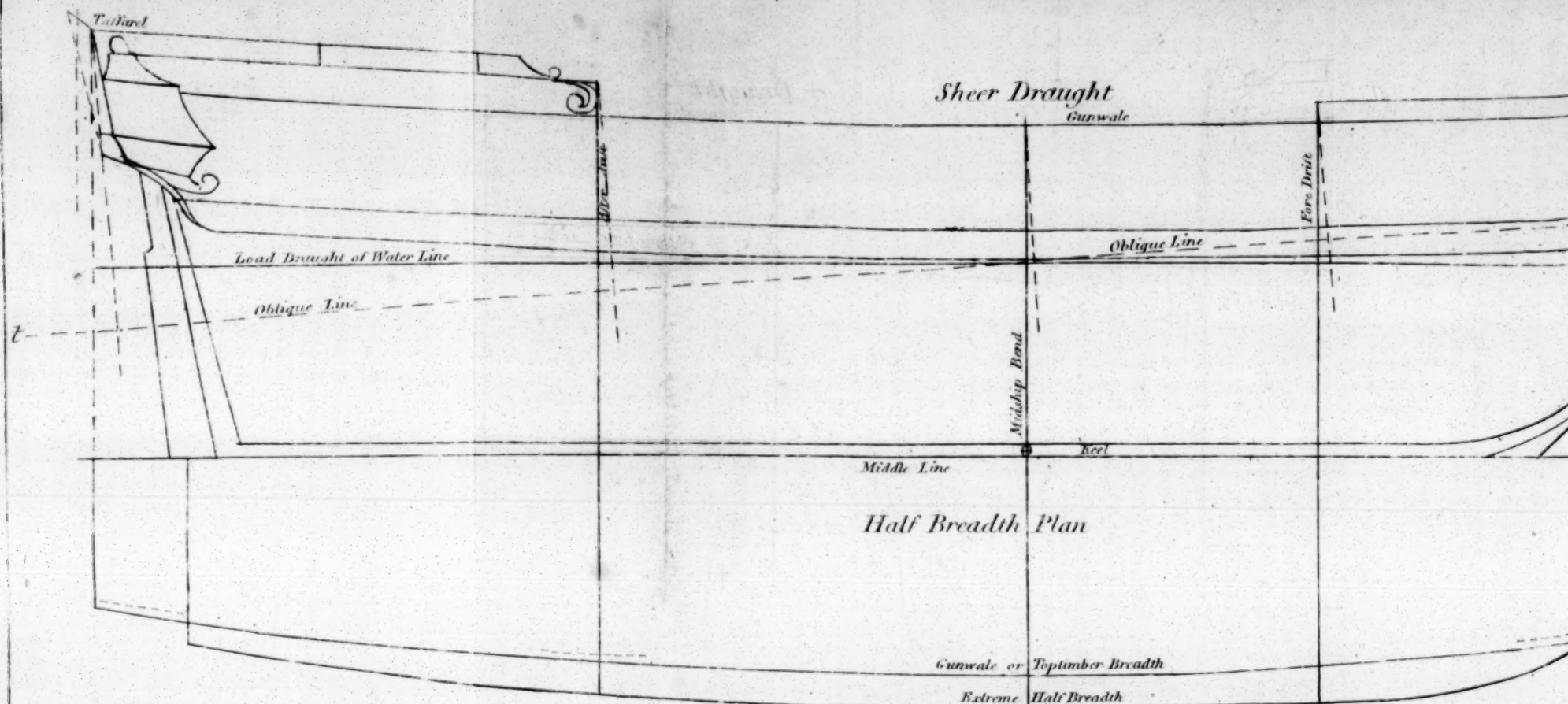
The *Perspective plan* thus prepared, we have next to consider how to elevate the points which are to be raised, which are to be done either by the method taught under the 5th proposition, or which may be more easily put into practice, thus; observe where the several vertices fall into the *imaginary base line*, and set up at each a perpendicular measured from the *Sheer-Draught*, from the load-draught of water upwards; raise, at the same time, the several perpendiculars from the spots in the *Perspective plan*, which determine the breadths at the gunwale, fore and aft, at the several places from the fore part of the figure at the head, to the after part of the taffarel or stern, when these perpendiculars

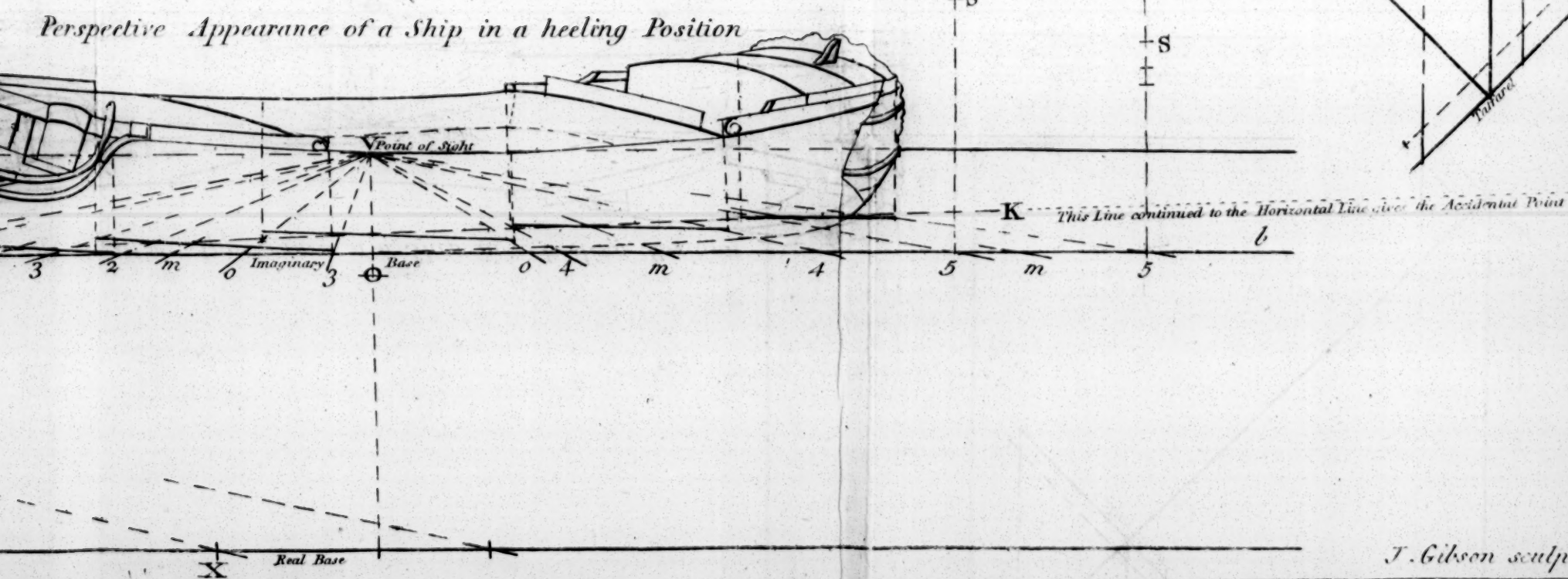
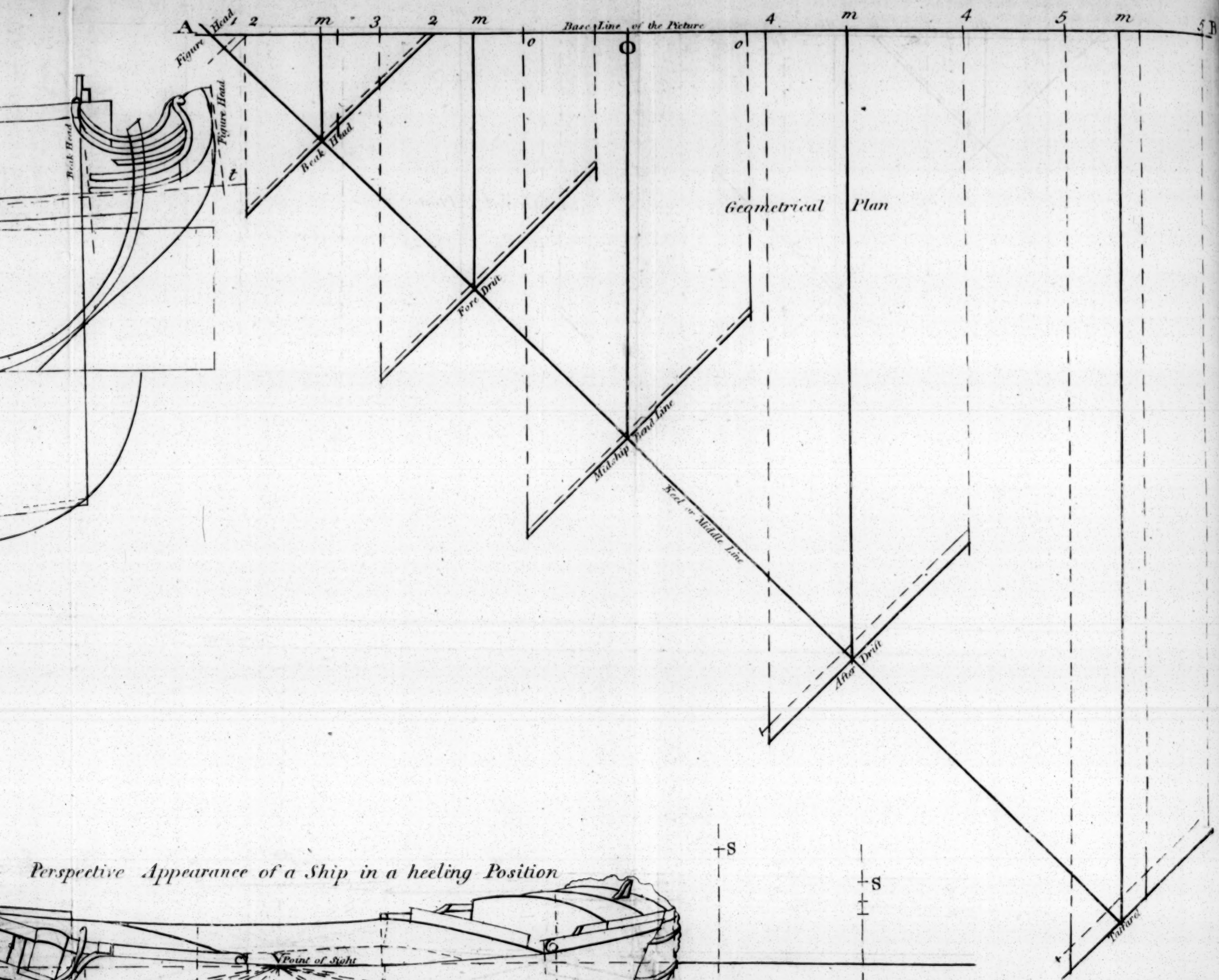
lars are pencilled in, and those along the foot of the verticals (in the manner you see at those which determine the breadth of the stern, marked ss) also set up, and the several heights measured from the *Sheer-Draught*, and marked on each, then lay a ruler to these spots, and the point of sight; and where they cross the perpendiculars in the *Perspective plans*, make a mark: when this is done at every perpendicular, and those spots carefully passed through with a curve line, you will have the perspective sheer of the ship as was required; which being obtained, the artist is to complete the design by carefully observing the *Sheer-Draught*, and body of the ship to be shewn in perspective, which he must have a strict regard to, and endeavour to have a clear idea of:

OBSERVATION.

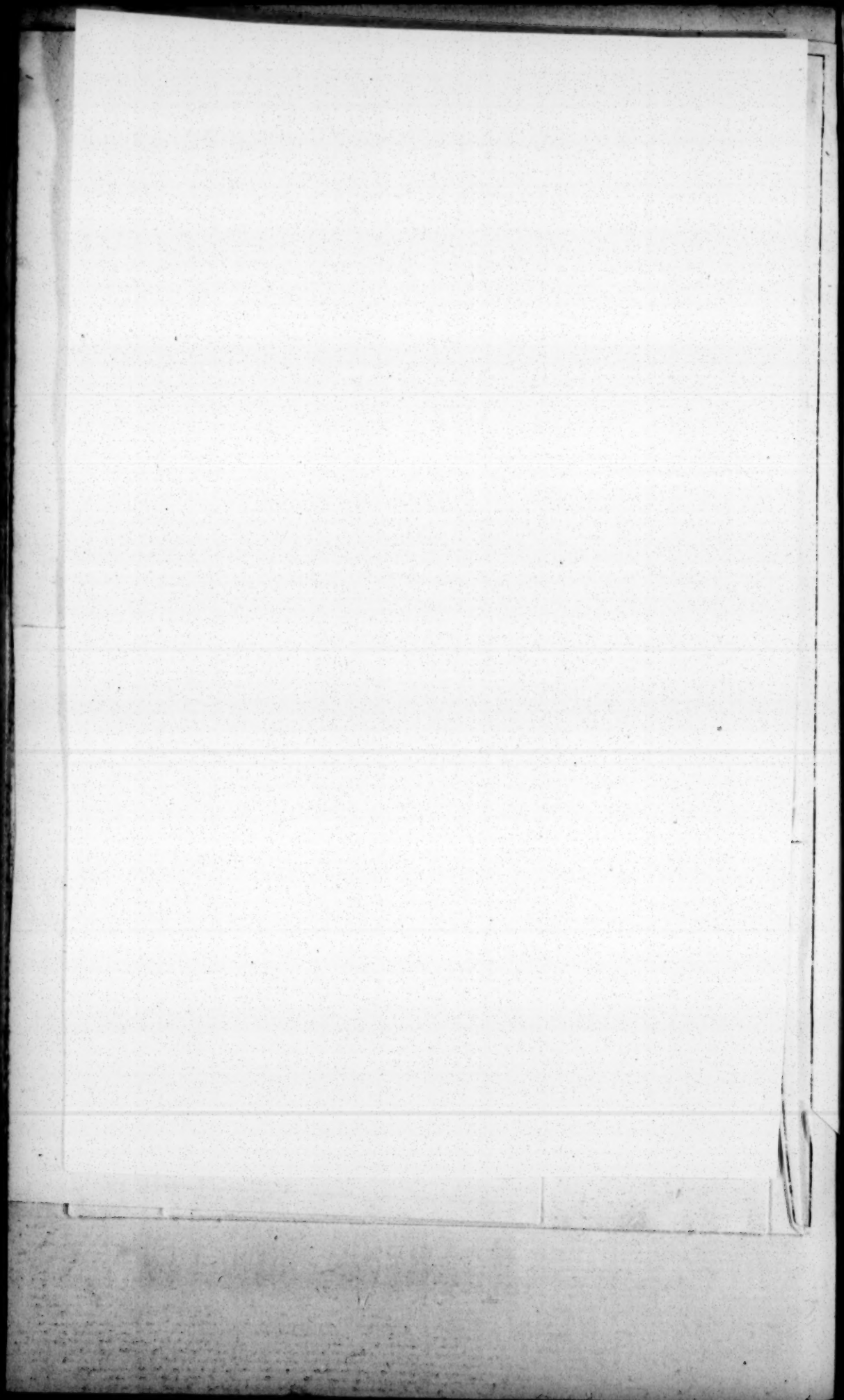
It will be necessary to remark on this proposition, that I have endeavoured to lay it down, and prosecute it with as much simplicity as possible, in order that it may be apprehended with more ease; for which purpose I have chosen for the subject, the part of a ship which appears above water, when brought down to her breadth, entirely naked and divested of all the parts between the water and gunwale, which project from the side, as the several channels, wales, gunports, &c. by projecting the most easy position to be prosecuted, and, at the same time, the most pleasing to the eye, as well as

least perplexing to the understanding to comprehend; but which, if carefully attended to, will easily lead the artist into the way of being as particular as he chooses; for instance, if he proposes to be so minute and curious as to find the places in the perspective design of the several channels and gunports, with their lids; he may, after he has obtained what is found by the foregoing proposition, proceed to lay down in the *Geometrical plan* of the *Sheer-Draught* before him, the several lengths of and places for the channels and gunports, and carry them up to the base line, perpendicular thereto, from thence continue them to the point of sight, and afterwards elevate them to their proper heights, as has been taught before; all which particulars I have purposely omitted here, in order to be as plain and intelligible to the learners of this science as possible, but yet if due attention be given to the foregoing proposition, as it is handled, and if imitated by way of exercise, there will be no difficulty in procuring these last mentioned particulars, or any other he may choose to shew, the method of proceeding being all the same as has been already made use of.





J. Gibson sculp.



PROPOSITION XI.

To procure the perspective appearance of a ship in a declining position (called heeling) in an oblique situation, and at a determined distance.

The first thing to be considered in this proposition, is what effect you would have the ship receive from the wind, that is, how much you would have the ship decline by the force of the wind, or, as it is commonly expressed, how much you would have her heel. This is to be chiefly determined by judiciously considering the design of the subject of the picture you propose to shew in perspective; as for example, whether a fresh gale or a storm, or if you propose to have more or less sail upon the ships you intend your composition shall consist of, always taking particular care to regard propriety and proper character in your objects, that your whole design may be natural and just; so conducted, that no absurdity be seen in the execution, but that every appearance in the piece may be accounted for, by the reason of the things represented; all which requisites are to be the subject of the artist's inquiry, before he can well be able to execute any design with accuracy. We shall proceed in the proposition before us; being therefore provided with the *Sheer-Draught*, *Body-plan*, and *Half-Breadth plan*, we propose to shew in a heeling position (see them all contiguous in *plate 4, fig. 1, &c.*) The first step

to be taken, is to consider how much one side (generally termed among navigators, the lee side) shall be depressed by the weight of the wind on the sails; which being fixed on, draw through the body where the load-draught of water line, marked *ldld*, cuts the middle perpendicular line, an oblique line, as *qq*, which is to be looked on as the proper water line for ships in the position we are now to shew, as we shall, without examining whether the whole body receives an additional immersion in the water, from the action of a brisk gale of wind on the sails; only suppose that the body turns upon an imaginary central line or axis, level with the surface of the water that passes from head to stern, so as to represent a middle line, which will be sufficient for our present purpose; in consequence of which, draw from the several spots which determine the breadths aloft at the gunwale, and drifts fore and aft, lines which shall pass the oblique line *qq*, and perpendicular thereto; when this is done; as you will observe by the body under the *Sheer-Draught*, the next thing to be considered, is to prepare the *Geometrical plan* of the ship conformable to this management of the body; in order to which, the first step is to lay down the strait or middle line in the direction you choose for shewing the perspective appearance of the ship; (I have made choice of the same situation in this proposition as in the former; namely, that in which the middle line, if continued to the base, would make an angle of 45 degrees, or a right

a right angle bisected, for the same reasons there given;) which being settled, and the place for the midship-bend fixed, proceed to set off from that, fore and aft, the several other distances of the places intended to be made use of for ascertaining the several breadths, from whence perpendiculars are to be raised, for completing the sheer above; which, when adjusted, and drawn through the middle line at right angles, transfer from the *Body-plan* the several breadths measured upon the oblique line *q q* on each side, from where the middle line crosses it, to each side of the middle line in the *Geometrical plan* thereof, at the several breadths, carefully observing, to make them correspond with each other; and strictly note, that you have a clear idea of these preparatory operations for producing the *Geometrical plan*, so as to be sure of the effect desired; herein regarding what was taught in the foregoing propositions; *i. e.* whatever side of an object you would have next the eye in perspective appearance, that side must, in the *Geometrical plan*, be next the base of the picture; and in the case before us, as we propose to have the ship in a declining position, and the lower side next the eye, you will, by examining the body, as it is now prepared, and comparing it with the *Geometrical plan*, find the management such, that it will necessarily give us the view in perspective, of the side we want to be next the sight, which is to be the lower one. So far being adjusted, the next step is, to draw the line *A B*,

D 4

which

which is to be made use of for the base of the picture, to carry the several lines from the spots to be found in perspective, and which must be perpendicular to the line above mentioned. See the manner thereof at the right-hand corner of *plate 4*, where you will find all the lines necessary to be made use of in the prosecution of this proposition: after this, it will be necessary to consider, at what height it will be proper to fix the eye, in order to draw the base and horizontal lines: these particulars are settled, in general, according to the intent of the design; but, as in the former proposition, I have chosen to fix the height of the eye about three-fourths of the height of the object above the water, as the lowest part or midships, it is drawn in accordingly; and the whole distance between the base line and height of the eye being divided into four equal parts, an *imaginary base line* is drawn at three-fourths of the distance between those lines, above that which is the real base, for the use described in the foregoing proposition. When this is done, and the several measurements expressive of the distances of the several perpendiculars drawn from the points in the *Geometrical plan*, up to the line representing the base *A B*, transferred to the line *bb*; you may proceed to find the perspective place of the several points from whence perpendiculars are to be raised, for finding the curvature of the sheer in perspective, by the rules formerly given; or, which will be more expeditious, by finding

finding the perspective situation of the middle line, as in the former proposition; inasmuch, as we propose to have the nearest point on the line *bb*, assumed for the use of the base, that is, three-fourths from the real base to the horizontal line; and, at the same time, the perspective place of the point made by the intersection of the middle line and midship-bend, by having which two points, you will have at once, not only the perspective situation of the middle line, by laying a ruler and drawing from one point through the other; but also, by continuing this line to the horizontal line, you will have the accidental point; the distance of which from the point of sight, set along the horizontal line on the contrary side of that point, will give the point in which the several lines, expressive of the plans of the breadths, fore and aft, will meet, if continued; so that, if lines be drawn from the intersections of the several plans for the breadths, and the middle line marked in, to the line representing a base *AB*, and from thence transferred carefully to *bb*, and from thence continued to the point of sight; at the same time drawing up the other verticals to the same point, by laying a ruler from this last mentioned accidental point to the intersection of the middle line, with the several verticals marked *m*; you will have at once the perspective situation of the several places, for finding the breadths; and also the proper length of each between its respective verticals.

When

When thus far is effected, the next step will be to elevate the several points for ascertaining the sheer; for which purpose, having raised perpendiculars on all the spots in the *Perspective plan*, expressive of the sheer line, and, at the same time, having raised perpendiculars at the spots, where the several verticals pass the line *b b*, transfer from the body the several lengths of the perpendiculars measured from the oblique line upwards, (expressive of the several heights from the surface of the water to the gunwale,) to the perpendiculars raised at the foot of the several verticals on the line *b b*; carefully observing, that you keep the perpendiculars for the depressed side to the hither side, as we propose to make the ship heel towards the eye; and those for shewing the elevated side must be kept to the verticals of the opposite or remote side: [See the manner of this way of proceeding, at the two verticals, which express the breadth of the stern on the line *b b*, on the perpendiculars raised at those spots, whereon is marked the height of the taffarel on each side, transferred from the body.] When this is done, by laying a ruler on the point of sight, and at the height of each of those perpendiculars last mentioned, mark on the perpendiculars of the *Perspective plan*, at the edge of the ruler, a spot to determine the height of each.

When this is effected, fore and aft on both sides, you will have the necessary spots, through which a
curve

curve line is to pass, to represent the perspective sheer of the ship we propose to shew. The design is then to be completed, by strictly viewing the *Sheer-Draught* of the ship you make use of for procuring the perspective appearance; which must always be carefully attended to in the prosecution of designs of this kind, as it will be impossible to produce any thing accurate, without a very intimate acquaintance with the *Sheer-Draught* of a ship, and the relation, dependence, and connection subsisting between the several plans, of which the whole is composed.

O B S E R V A T I O N.

By considering the foregoing proposition, the artist will perceive, that the most material circumstance is, the proper management of the *Sheer-Draught* and body; or rather, in this, the body principally, in order to prepare it for procuring from it the ground or *Geometrical plan*. Herein it will be necessary to recommend strongly, what was formerly mentioned under the article of Observations on Plans, as it will plainly appear, upon due examination, that the very essence of this proposition consists chiefly in considering, how the body is to be prepared, to procure the declining position, which we would exhibit in the perspective view; and further, it may be easily perceived, that the same ship may occasion a very great variety of plans, as the effect of the wind increaseth, and makes her

her heel down more and more ; every one of which is principally regulated, by drawing the oblique line through the body, so as to adapt the heeling of the ship to the intention of the design ; and herein frequent exercise will be absolutely necessary to render the artist expert, and ready at procuring any design he may choose to shew in picture.

But the necessity of carefully considering the nature of adjusting the *Geometrical plan*, will appear in the proposition following.

PROPOSITION XII.

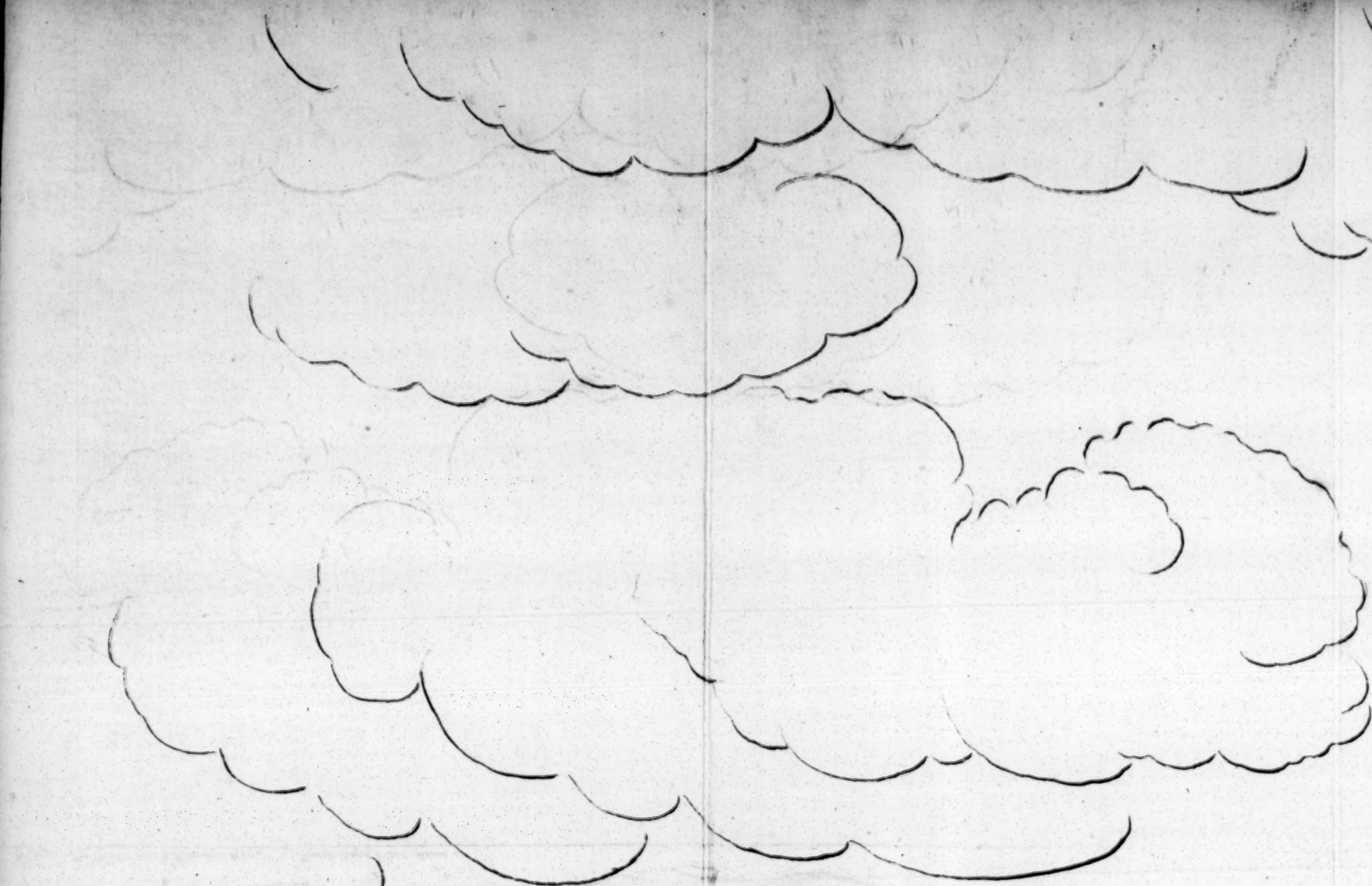
To procure the perspective appearance of a ship, when the head or stern is lifted by a sea, the ship at the same time heeling by the effects of the wind or water, or both.

In the prosecution of this, and all other similar propositions, the artist is first of all to consider, how much he proposes the head of the ship shall be lifted by the sea ; which having concluded, let him draw through the *Sheer-Draught* an oblique line, such as he sees in the *Sheer-Draught* in the 4th plate, marked *tt* ; by which line is represented. how much the stern (as we propose to shew the stern lifted) is to be elevated above the horizontal water line ; and also, how much the head is to be depressed below the same ; which being settled, the next step is, to draw from the gunwale, at the places we propose to make use of for finding the various breadths

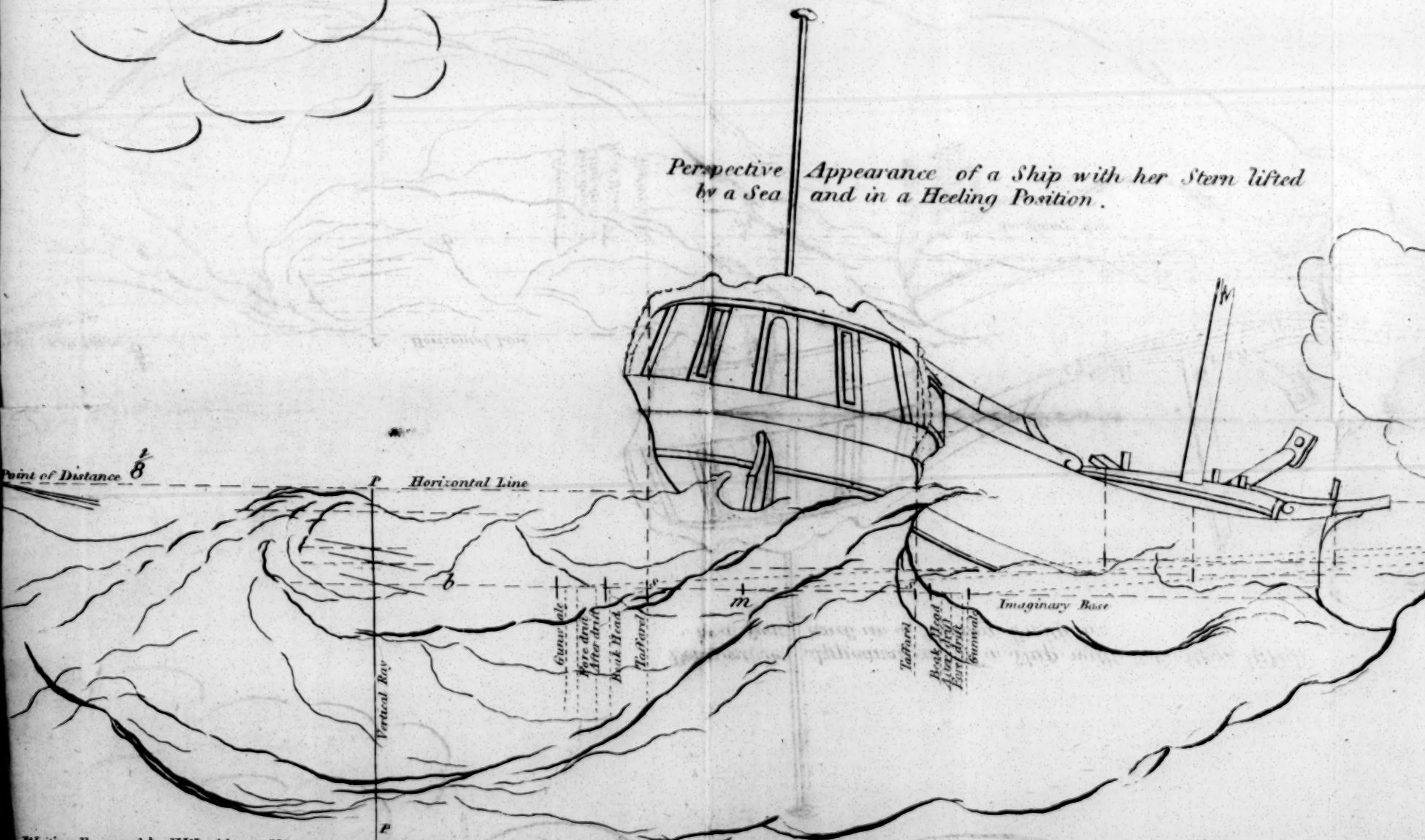
breadths in perspective, several lines, which must be perpendicular to the oblique line tt ; all of which you will see distinguished by being dotted in, and they serve to determine the length of the *Geometrical plan* of the ship to be shewn in perspective. The plan of the length will be in this case somewhat contracted, and more or less so, according as the ship is more or less lifted up by the wave.

When the *Sheer-Draught* is prepared, as above described, the necessary management of the body is next to be considered: and, after having fixed on the degree of obliquity suitable to the purpose, or how much the ship shall heel, draw through the body, at the place where the load-draught of water line passes the middle line, a line which shall answer the purpose above mentioned; [in the present proposition I have made choice of the same as made use of in the former, for the reasons there urged;] in consequence of which, draw from the dotted heights of the gunwale fore and aft, drifts, head, and taffarel, on both sides, lines which shall pass the oblique lines qq at right angles; when this is carefully done, as you see in the *Body-plan*, *plate 4*, turn again to the *Sheer-Draught*, and transfer from thence the lengths of the several perpendiculars from the oblique line tt upwards, and measure each of them from the top-side at each respective place to which they belong, down the middle line; and from each of these spots on the middle line draw
a line,

a line, which shall be parallel to the line $q q$, and so as to extend without the limits of the body. This being effected, the next step will be, to prepare the *Geometrical plan*, according to the contraction which it suffers from the obliquity of the position of the ship; which is done, by laying down a line for the middle line, and setting off the several distances as they stand on the oblique line. [See the manner, extent, and dimensions thereof, particularly distinguished in the 4th *plate* in the *Geometrical plan* of the ship, herein inserted by the dotted lines.] When thus far is done, adjust the base and horizontal lines; the latter of which, conformable to the height you propose the eye of the spectator shall be, by observing the 5th *plate*, is fixed at 8 feet by a quarter scale, and drawn in accordingly just that distance from the base line; at the same time, it will be necessary to remark, that the *imaginary base* is also drawn in for the use before described, and retained in this, as it will be equally necessary, as we are now going to lay down the requisites for procuring the *Perspective plan*: in order to which, draw from the point of sight V, a line at pleasure, which shall fall into the *imaginary base*, remote from the centre, and will serve for a middle line, as, in the present case, we shall propose the ship in a position wherein the keel or middle line is perpendicular to the base, or, if continued through the base, would cut that line at right angles. In which case, we have said before, that



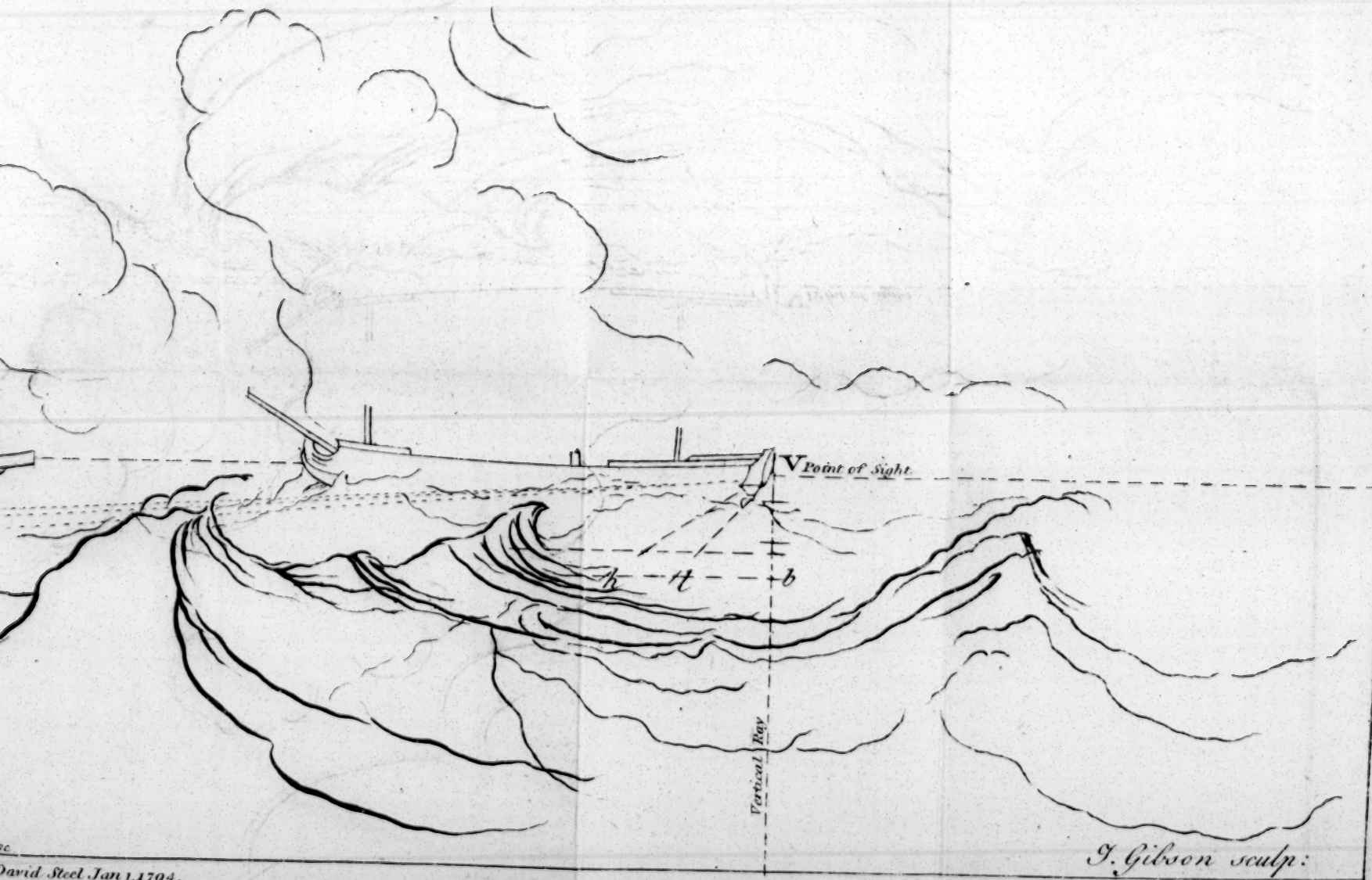
*Perspective Appearance of a Ship with her Stern lifted
by a Sea and in a Heeling Position.*

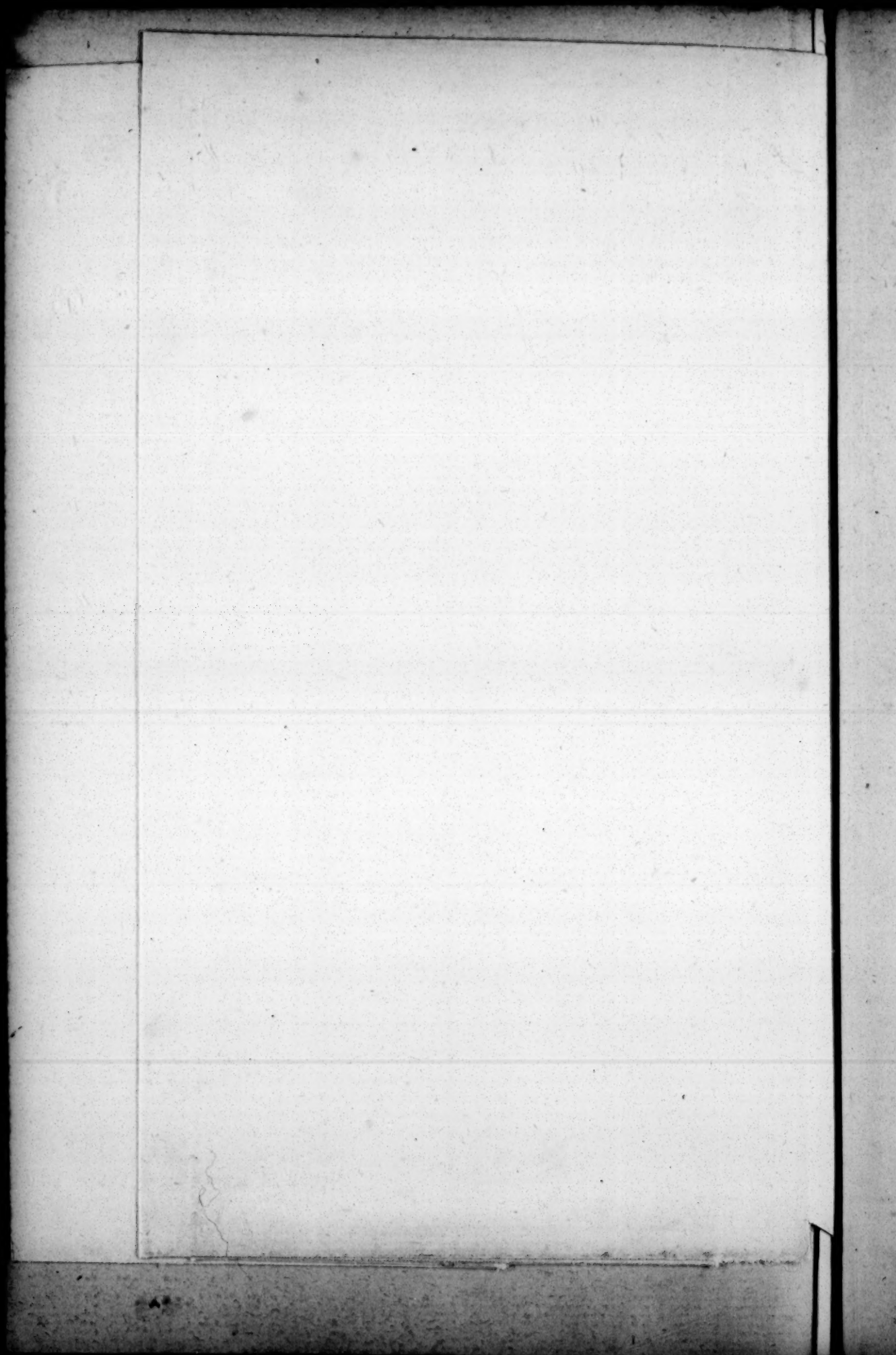


Writing Engraved by V. Woodthorpe N^o 27 Fetter Lane Fleet Street

Real Base
Published as the Act directs by David Stee

Plate V.





that the middle line will be a vertical ray; from which, on each side, set the several breadths measured on the oblique line $q q$ drawn through the *Body-plan*, on each side thereof where the middle line crosses it, and transferred to the line $b b$, on each side of m ; which when done, draw from each of those spots a line to the point of sight, all of which will be verticals for determining the perspective breadths at the several places made use of for that purpose. The next thing to be done, is to find on the line marked m the distances in perspective of the several places expressive of the breadths fore and aft, (assuming the line $b b$ for the nearest, or over which the top of the taffarel is to be elevated, for reasons before advanced,) all of which will be parallel to each other, and all of them to the base of the picture.

This being carefully effected, by the instruction given for readily finding the distances in the former propositions, by means of making use of an eighth part of the whole distance from the eye to the point of sight, instead of the whole length or distance, there needs but little to be said here relating thereto, excepting to observe, that there must be a spot found in perspective on the line marked m , for each of the lines expressive of the breadths cross the middle line in the *Geometrical plan*; the nearest of which, as we have said before, must be on the line $b b$, and is expressed by $s s$, and at the determined distance of 192 feet.

When

When this is done, as directed, the next thing to be considered is, to elevate the several points, in order to procure the sheer above, and the general form and appearance of the ship to be shewn.

In order to which, it will be necessary to observe, that when the several perpendiculars are raised from the spots in perspective, the measurements for ascertaining the several altitudes of the parts, must be transferred from the *Body-plan* as it stands regulated by the dotted lines. Thus, for instance, in order to procure the perspective altitude of the taffarel, take between a pair of compasses the lengths of the perpendiculars which reach from the taffarel to the oblique dotted line which lies lowest in the *Body-plan*, marked *ff*, and transfer it to the perpendicular line raised where the marks *ss* are, carefully minding to take the right for each side, as first intended. As, in the case before us, we propose to shew the ship heeling towards us, it will be proper, therefore, to erect the shorter on the side next the centre of the picture, and the longer on the off side; making use of this method to all the other places forward, at least all the hither side, and such of the off side as come into view; and by laying a ruler on the spot, shewing the real altitude marked on the perpendiculars last mentioned; and on the point of sight, make on the perspective perpendicular a small stroke, just to retain the proper perspective height

height on each, you will have, on the perspective perpendiculars, heights of the several places ascertained, for shewing the perspective sheer of the ship, in the position, situation, and at the distance we first proposed.

But, if this method of finding the several altitudes in perspective should not appear so easy to put into practice, the method advised under the 5th proposition, namely, by continuing the several parallels in the perspective plan expressive of the breadths, to the perpendicular vertical ray, and measuring on the line bb , from the foot of that ray, the heights of the higher and lower side, which draw up to the point of sight, and the length included by these lines hl , will give the true perspective lengths required. See an instance, in finding the perspective heights of the midship-bends on both sides, in *plate 5*, which, with a little attention, will serve for a guide in any case whatever.

Nothing will remain to be done, but to find the curvature of the main wale, for ascertaining the extent of the stern of the ship, up and down, and across the lower counter; as likewise, the distance in perspective between the cat-head and main wale; and, lastly, to finish the out-lines, by strictly regarding the *Sheer-Draught* you propose to shew the perspective appearance of; to which, as we have said before, frequent recourse must be had. Thus you will have the necessary requisites for procuring the form of the ship in the situation

E

and

and position intended: to which the water must be raised to represent the swell of the sea, in the manner of its fluctuating when agitated by the winds; observing a proper freedom in the strokes made use of to describe the several waves.

I have only just explained my meaning of what is said above, in the 5th *plate*; the preparation of the *Body* and *Geometrical plan* of which are particularly distinguished by the dotted lines in the *Sheer-Draught*, *Body plan*, and *Half-Breadth plan*, made use of in the 4th *plate*.

OBSERVATION.

The artist will easily perceive, that the greatest difficulty of the two foregoing propositions is, to adjust the *Geometrical plans* by the proper management of the *Sheer-Draught* and *Body*; and, that what is to be done afterwards is nothing different from what is taught in the introductory propositions of this work; therefore, those being well understood, these cannot be difficult in their operation, after the above particulars are well considered.

There can be no position but what is reducible to those which are handled in the foregoing propositions; for all positions may be said to be only a less or greater degree of obliquity of the same species. I have endeavoured to be as brief as the nature of the subject would admit of, by making

ing use of the fewest possible means, so as to be able thereby to produce the effect desired. But yet, if any are desirous of being more particularly curious, it will be easy for them to be considerably more minute, by following the same steps, as in the foregoing propositions, supposing the Subject be a model of frame timbers, which has as great variety as any body that can be mentioned. It will be easily apprehended, that several horizontal sections must of necessity be assumed between the gunwale and keel, to give a competent number of spots in the *Geometrical plan*, and from that in the perspective, to procure the variety of curves of which such a structure is composed; and the difficulty of producing such a representation will rather consist in the great variety and multiplicity of the preparatory lines, than in the manner of the operation; for, after all that can be advanced to render the acquaintance with the science of perspective discouraging, it will ultimately be resolved into this plain proposition, *viz. to find the perspective place of a point at any given distance, and to raise it to any given altitude*; indeed the practical part of the propositions is very easily comprehended, but there is some judgment required to order the *Geometrical plans* from the consideration of the bodies to be represented, according to the intention of the design, a facility in which is to be acquired by diligent practice, and by beginning with easy things.

With all this previous knowledge for drawing single objects ; it may not be improper to consider the three essential requisites in the composition of a set of picturesque objects.

OF THE POINT OF SIGHT.

The point of sight, a term in perspective, which is frequently expressed, though not always with any proper idea connected with the expression, and perhaps sometimes without any at all, means nothing more than the imaginary point, or spot in a picture, to which the eye directs its sight ; for, as in natural views, all the compass that can be taken in at one fixed station of the eye, without moving the head, may be called a natural view or picture ; so in representations of natural views, the point of sight in perspective, is the point or spot which has a relative meaning to the unmoved fixture of the eye in natural views: from this consideration, I think it will be very obvious, that a picture will admit of but one point of sight, as the effect of vision, while the head is kept still and in the same position, may be called one view ; but, I think, none will call that one view, which to behold, the spectator has turned his head the least from the point of vision first fixed on ; consequently, that where there is more than one point of sight admitted, it may not improperly be called two or more pictures joined together.

Adopting therefore the notion of one point of sight to one picture, as being more regular and agreeable

greeable to the idea of one view, it will be, perhaps, not altogether useless, to say how it is to be placed, and something with respect to what part of the horizontal line it should be fixed on. The middle, or a point equidistant from each end of the picture, may in many cases be made choice of, or if it be a little distant from the middle on either side, any where in the middle division, supposing the whole picture divided into three equal parts, which, I think equally good, if not preferable to the middle; neither will it be amiss, that some capital object in the composition, if not the principal, should strike the sight, provided the particular circumstances of the picture do not demand the contrary. Again, with respect to the height of the eye, or point of sight, which is one of the principal things to be adjusted, it is generally regulated according to the subject to be shewn, that is, if the objects are to be capital ships, or those of the larger classes, then this point of sight (or horizontal line, in which it always is to be fixed) may be commodiously fixed about three fourths the height of the lowest part of the ship, that is the principal object, which is generally on the midships; so that part of the body of the principal object, and all others of a similar magnitude may appear sufficiently elevated above the horizontal line.

But, if the principal objects are small ships or vessels, such as brigs, or one-mast vessels, hoys loaded, other small crafts, as lighters, boats whose

structures are shallow in depth; in such case, the point of sight (or horizontal line) may then appear equal in height, or sometimes above the principal objects, or such as are to be shewn in the most eminent manner, and in such cases, the view is to be considered to be taken as sitting on the shore, or in a boat, for the horizon cannot be supposed to exceed the height of four or five feet, few of the vessels before hinted exceeding that height above the surface of the water, especially when loaded; however, in all cases of this sort, care must be taken to render the objects pleasing to the sight; as for those designs, in which the horizontal line is fixed above the ship's masts, they are generally worthy of being called no better than monstrous productions. In which it is not uncommon to see the horizontal line pitched considerably above the ship's mast-head, though, at the same time, the ingenious artists seldom think it necessary to exhibit the least view of the inside of any of their objects, which is contradictory to the most obvious laws and effects of vision: and, whatever particular occasions there may be for producing these sorts of representations, it will be impossible to make them worthy the names of picturesque performances.

OF THE MANAGEMENT OF OBJECTS.

The proper management of the several objects to be shewn in perspective (especially such as are the subject of this treatise), so as to produce from them

them agreeable appearances, is a circumstance of too much moment to be altogether neglected; and consists in the judicious choice of what may appear pleasing when placed to advantage; for, as the most beautiful object may be so disadvantageously posited as to diminish its beauty, in like manner the bodies of ships may be more or less beautiful, according as they are more or less artfully disposed in a picture; thus, for instance, if a ship of the larger class be placed near the base of the picture, and fore-shortened, unless the eye be elevated with great judgment, the representation will be very unpleasing, as the parts near the sight will appear very large, and the remote parts very disagreeably diminished, the nearer parts lifted up, and the remote parts seemingly buried. This is generally the case, when the eye is too low, and may be obviated by taking care to elevate the point of sight, to, at least, three-fifths of the height of the nearest part of the object.

With regard to the choice of ships most proper to produce pleasant representations, I have found that ships quick sheered, do not offer equally pleasant views, as those which are straiter by their construction, or are become so by age; and, as this property of being too quick sheered will be incommodious in most positions, so it will be most particularly so in those, where the view of the side is contracted to a little space, because in such, the quickness of the sheer will shew itself in the most disagree-

able light; to obviate which, when such positions must be admitted, it will be very necessary for the artist to draw from midships, fore and aft, where the main wale falls into the load-draught line, a curve each way that shall be a proportional medium between these two; and, by taking the measurement of the several heights from where the last mentioned curve line passes the perpendiculars, instead of taking them from the strait water line, where the same perpendiculars pass; you will have your sheer produced straighter, though, at the same time, the identity of the ship to be exhibited, will not be destroyed, nor any thing contradictory or repugnant to the laws of the nature of those structures, hereby introduced. With respect to what part of the distance between the base and horizontal line, the capital object in general, and unlimited designs shall occupy, I am of opinion that the same made use of in the foregoing propositions, namely, three-fourths of the height of the horizontal line, from the base, or thereabout, as good as any, though on particular occasions, this rule, as well as most others, may be under the necessity of being transgressed by the experienced and judicious artist.

OF THE ANGLE UNDER WHICH OBJECTS
ARE TO BE VIEWED.

The angle, under which an object or set of objects is to be viewed, is of use to regulate the
station

station of any spectator, so as he may view the prospect to advantage, by assigning such a proper distance from the nearest object that he may commodiously take into the visual organs, the extremity of the object or objects he proposes to make the subject of his observation; for instance, if a person was inclined to view the structure of a first rate man of war, it would not be proper to go close to the ship for such a purpose; because, by so doing, he would not be able to take a view of the extremities of such a large body, but rather keep at the distance of 100 yards perhaps, from whence he might command a more particular prospect of the several parts, and at the same time, of the whole body. The writers on perspective propose rules for this purpose, though they do not all agree upon it; some being for establishing the angle of 60 degrees, or that whose sides from the eye to the extremities of the picture (supposing it so fixed as to look at the middle of the horizontal line) would be the same lengths, each of them, as the picture is, that is, an equilateral triangle; others, contending that the angle above is too large, and asserting that it is not easy to command a commodious view of an object under the angle above described, from a natural obstruction, or at least a difficulty in the optic nerves, to take in the extremities of an object, so near as the angle above situates us, conclude that an angle of 50 degrees in the aperture is more convenient than that of 60, as the eye will be more
able

able to take a view of that extent than of the former; others, again, rejecting the two above-mentioned ways, substitute in their room, in general, the length of the picture to be a proper distance for the eye of the spectator to be from it, to have the most commodious view of the object or set of objects to be viewed; and, if the subject be a single object, then the whole extent of the greatest dimension thereof on the base line, will be a proper distance to place the eye from the base, so that this will be a view under an angle less than 60 degrees, and greater than one of 50, and perhaps is preferable to either of them.

The directions before mentioned being, if sufficiently attended to and practised, all that need be said to lead a young artist into the way of producing correctness in his drawings of the various subjects which appear on the watery element; I shall now draw to a conclusion of this sketch of naval perspective, adding only, to make it more complete,

An easy method of finding the distance of a point, so remote as not to be performed by the general method for finding a point in perspective.

In this case, therefore, we shall propose to the consideration of the young practitioner, the use of similar triangles, and for the sake of illustration of this necessary circumstance, observe that, in *plate*
4, the

4, the triangles uuX , and $P y X$, are called similar triangles, that is, if in any rectilinear triangle, uuX , a line be drawn within at any distance from any side, as yP , and parallel to uu , then will yXP be similar to uXu , and the corresponding or similar angle will be equal in both, which have also the property of being proportional one to another, that is, as uX uu PX Py ; to apply which property to our present purpose, let XPu be the base, and Pu the horizontal line, of which let P be the point of sight, and u the point of distance, also let PX be the length of the distance of a point below the base uX , and transferred along the base from the point wherein the vertical ray PP falls into it, (according to directions given heretofore,) and let uX be the visual ray to determine on the vertical PP , the perspective place of the point y , being thus adjusted, we have now to apply it to use, that is, we are to find the point y without being obliged to set PX along the base (supposing the paper would not admit of it). To effect this, let it be noted, that uu , (height of the eye,) is always determined and known; uP on the base uX is also known, being equal the distance between the point of sight and point of distance in the horizontal line, and PX the distance of the point to be shewn in perspective from the base, is always known and determined; therefore, as the length of uPX is to the length of uu , so is the length of PX to the length of P , (on the base,) y , for the height

mea-

measured from the base of the perspective point y . And further, the knowledge of this most useful geometrical figure may be very necessary in laying down the vertical ray of a point on either side of the perpendicular vertical ray, but so remote from the last mentioned, that there may not be extent enough of paper to draw in the base line: in this case let it be remarked, that $u y X$ will represent the vertical ray required; but, by reason of the paper's extending no further than $P y P$, we cannot extend the base so far as X ; therefore, in order to find the part of $u X y$, comprehended between u and y , or y on the line $P y P$, (supposing that to be the edge of the paper,) here, as before, $u u$ is always known, and $u P$ is known by measuring; and also $u P X$ is determined by the nature of the design, (as we know how far the point X shall be from the perpendicular vertical ray,) therefore, as $u P X$, (on the base,) is to $u u$, so is $P X$, (*i. e.* $u P$ deducted from $u P X$) to P , (on the base,) y , for the spot on the edge of the paper, from whence to draw the part of the vertical ray required. Again, by a thorough knowledge of this most useful geometrical figure, a rectilinear triangle, the precise distance between two or more objects in perspective, may be determined either in the regular designs of others, or in what we design ourselves.

The consideration of this method will be well worth the artist's care, as by the help of it, he may
find

find and ascertain a distance of points, which would otherwise be extremely difficult, if at all possible to determine, but which may frequently be necessary in order to fix an object, whether ship, &c. or head, land, &c. which, with what has been said before, will be sufficient to enable any intelligent person to become an able master of naval perspective, the principal intention of this much wanted undertaking.

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